10021711-20030903

FIG. 1A

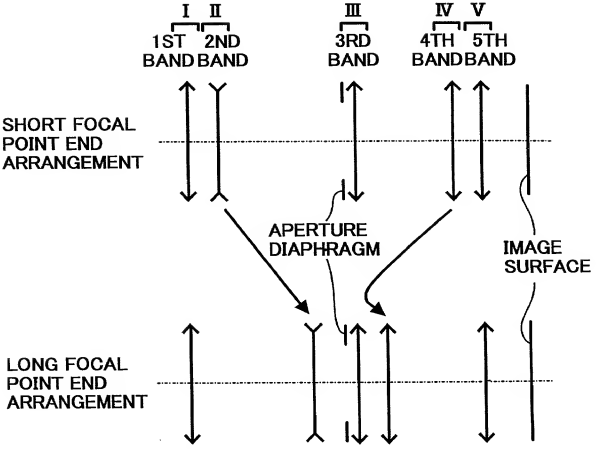

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FIG. 1B

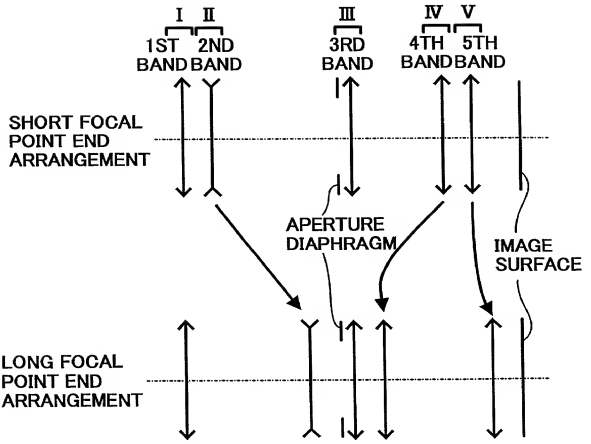

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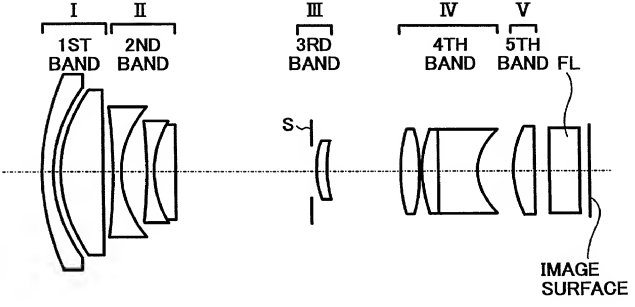
FIG. 2



09888793-112001

FIG. 3

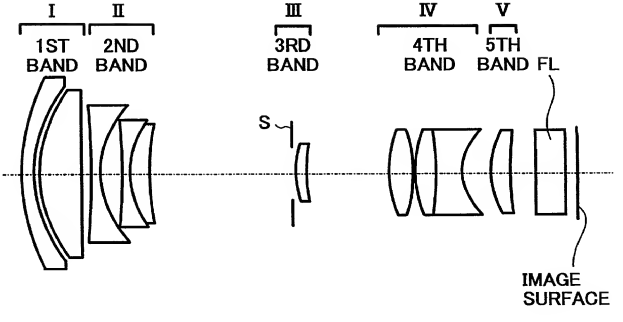
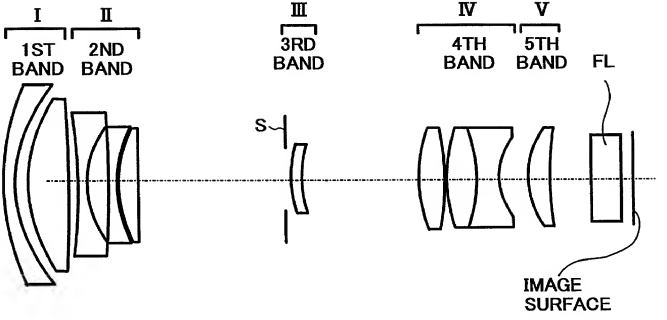
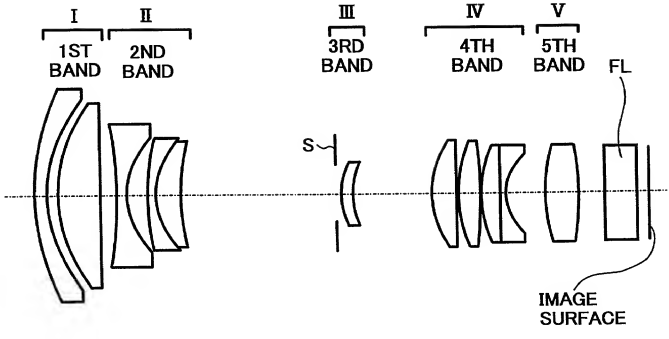


FIG. 4


I
II
1ST BAND
2ND BAND
III
3RD BAND
S
IV
V
4TH BAND
5TH BAND
FL
IMAGE SURFACE

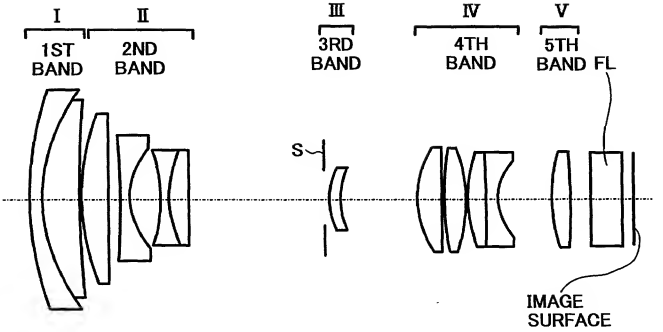
EP 2 141 523 A1

FIG. 5



09998703 - 112001

FIG. 6



09688793 .112004

FIG. 7

SHORT FOCAL POINT END EXP. 1

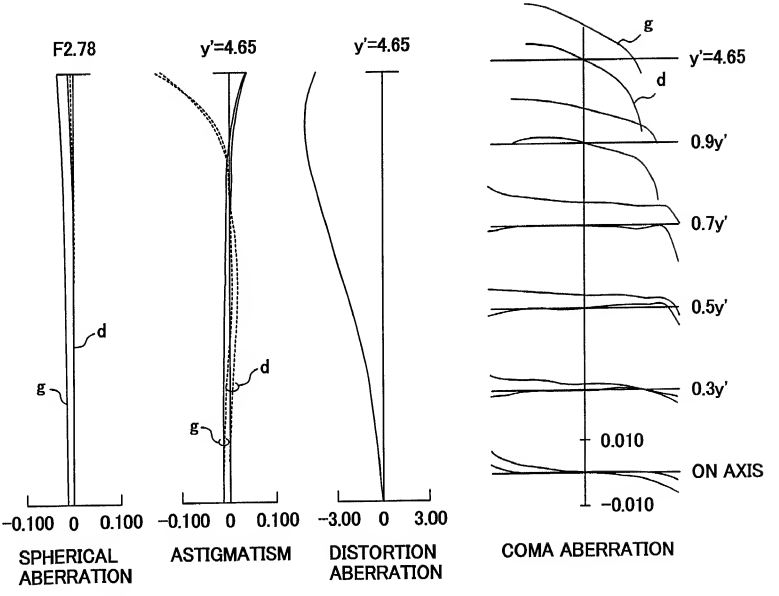


FIG. 8

MIDDLE FOCAL LENGTH EXP. 1

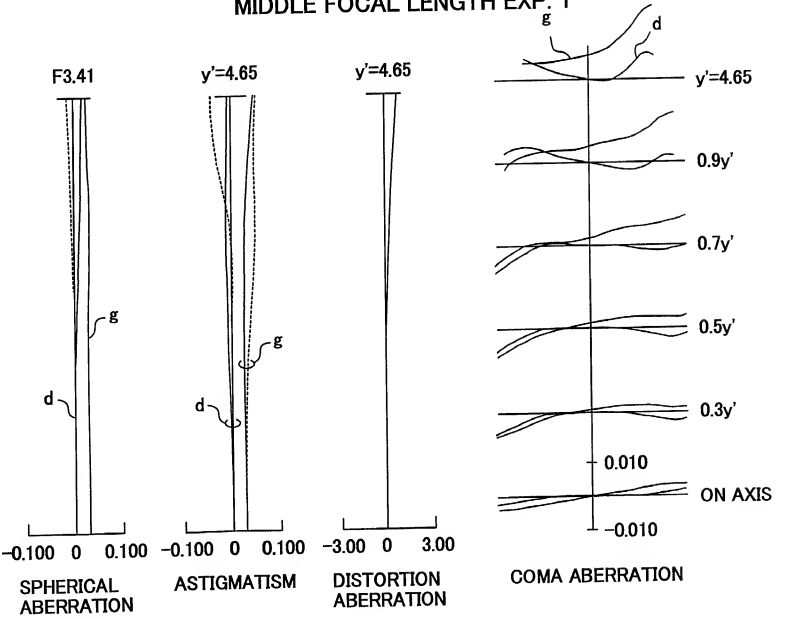


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FIG. 9

LONG FOCAL POINT END EXP.1

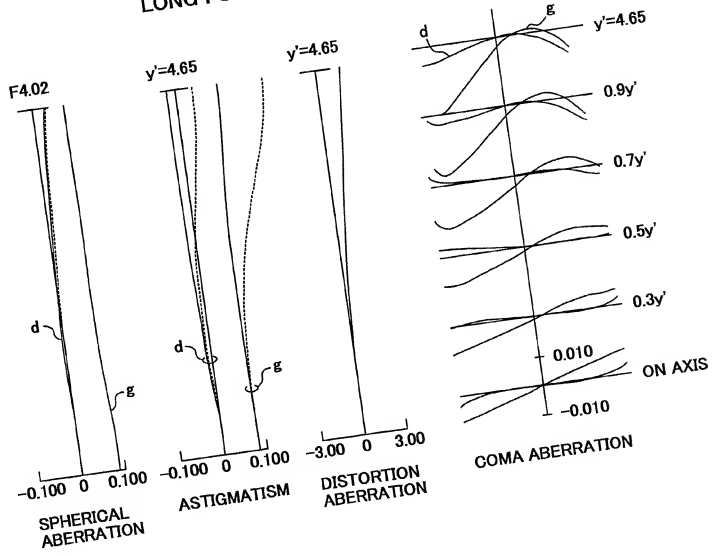

FIG. 10

SHORT FOCAL POINT END EXP.2

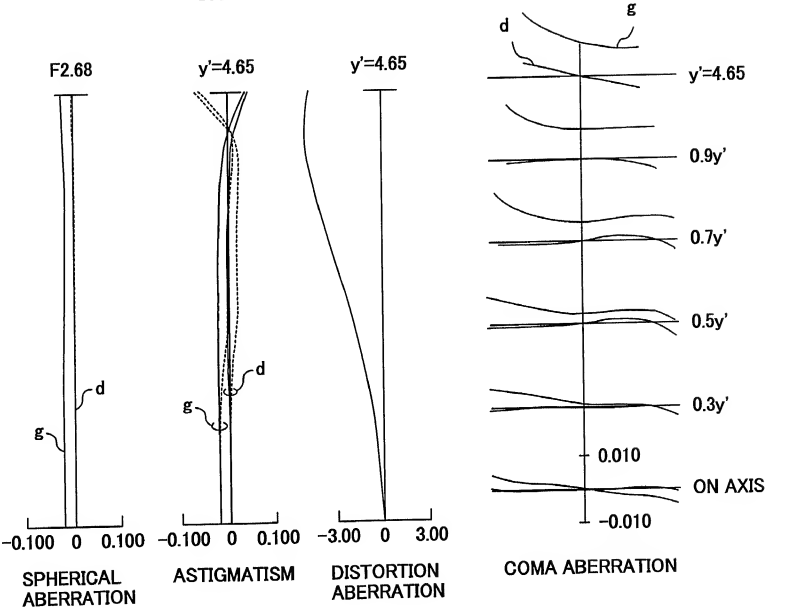

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FIG. 11

MIDDLE FOCAL LENGTH EXP.2

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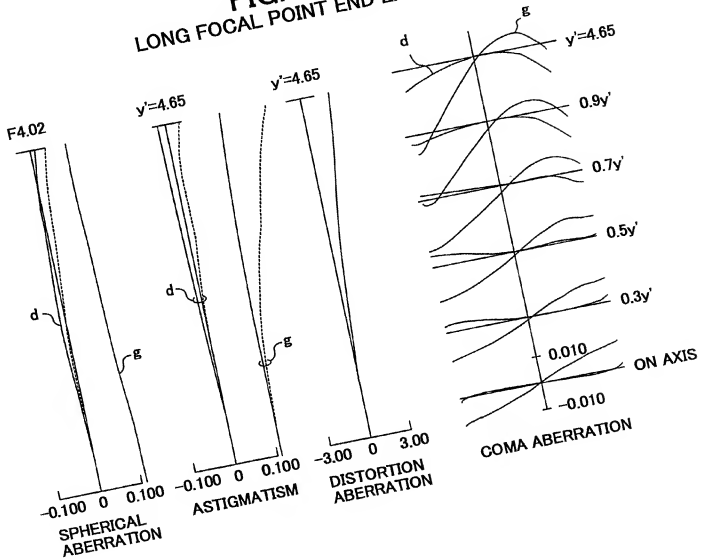
FIG. 12
LONG FOCAL POINT END EXP.2



FOCAL LENGTH 6.88660

FIG. 13
SHORT FOCAL POINT END EXP.3

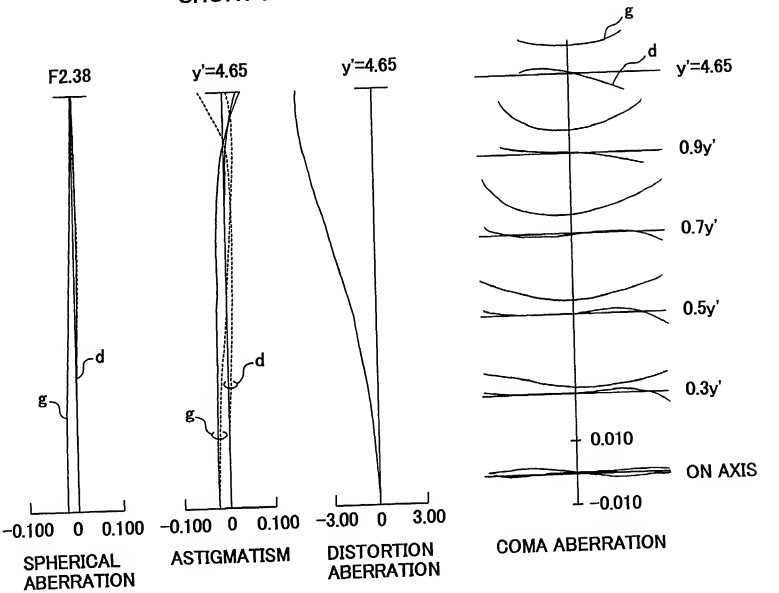


FIG. 14

MIDDLE FOCAL LENGTH EXP.3

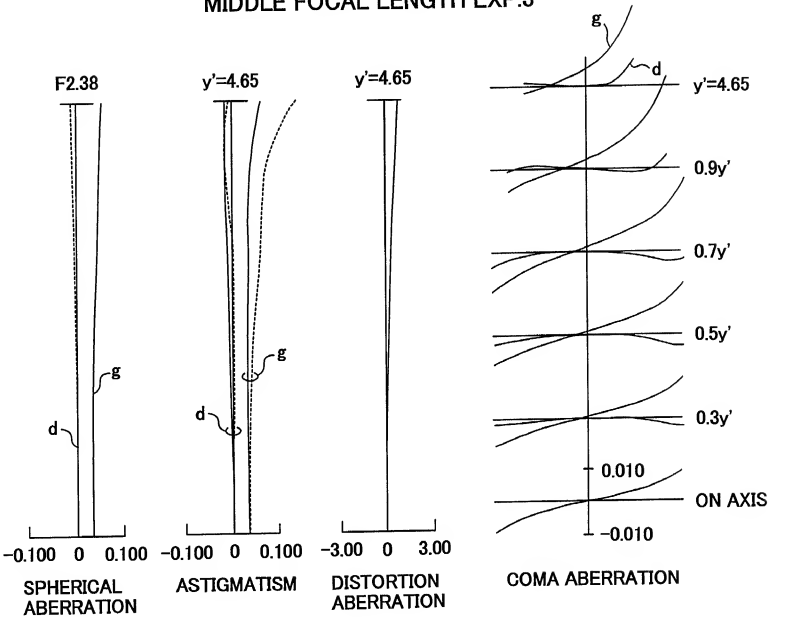


FIG. 15

LONG FOCAL POINT END EXP.3

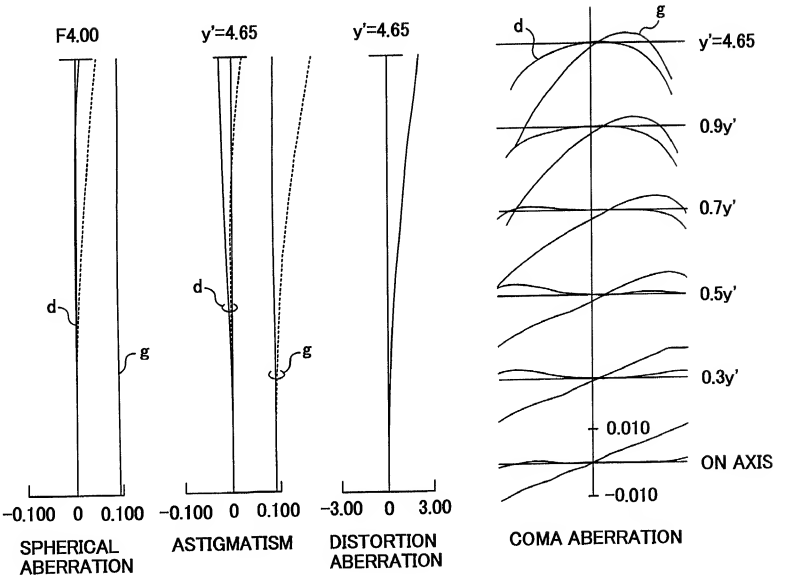


FIG. 16

SHORT FOCAL POINT END EXP.4

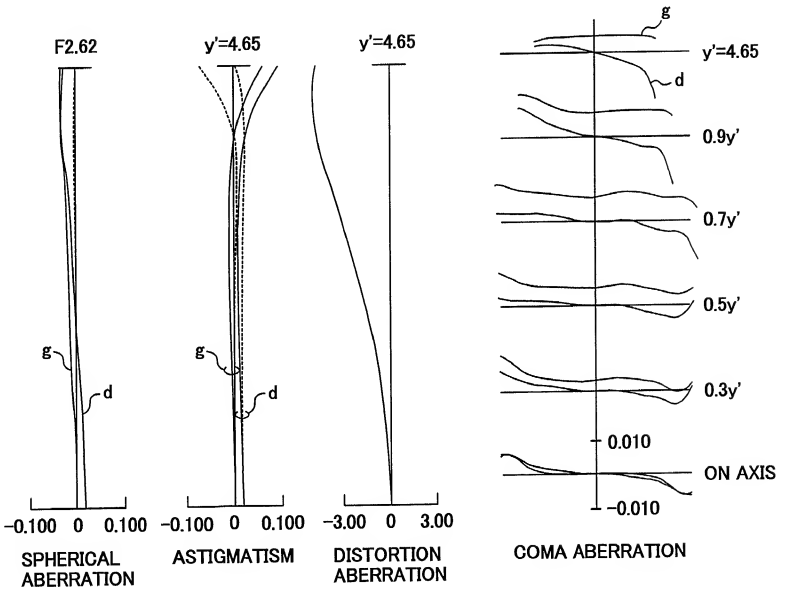


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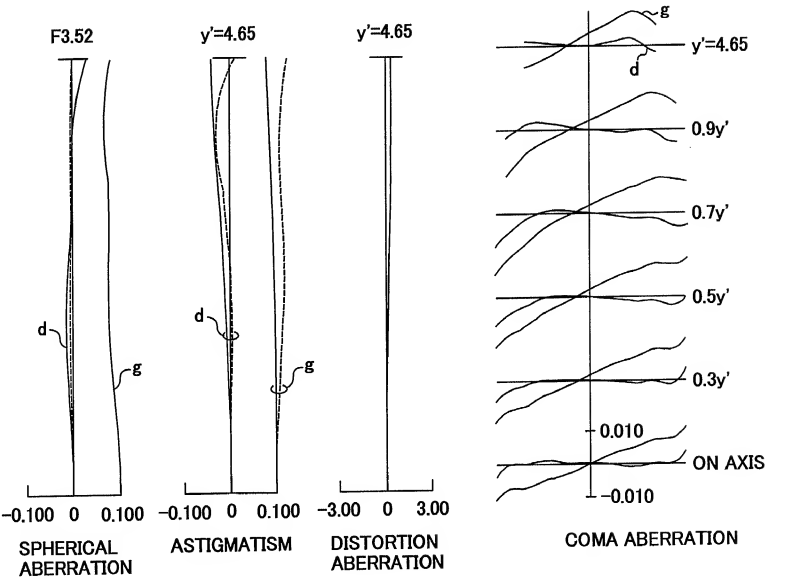
FIG. 17
MIDDLE FOCAL LENGTH EXP.4



EP 2 112 541 A1 6288660

FIG. 18
LONG FOCAL POINT END EXP.4

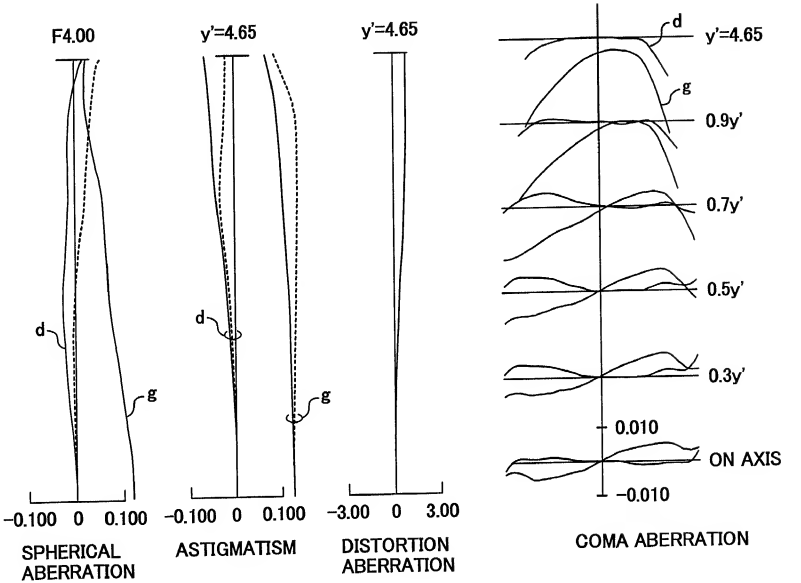


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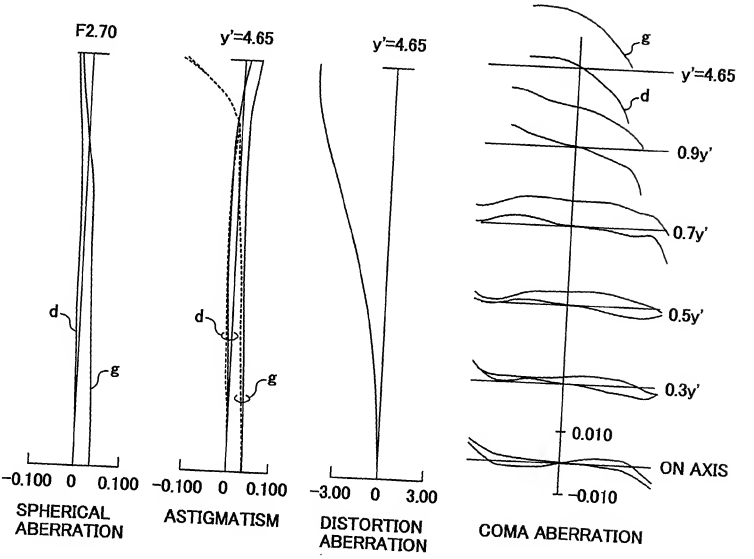
FIG. 19

SHORT FOCAL POINT END EXP.5



EP 2 278 368 A1

FIG. 20

MIDDLE FOCAL LENGTH EXP.5

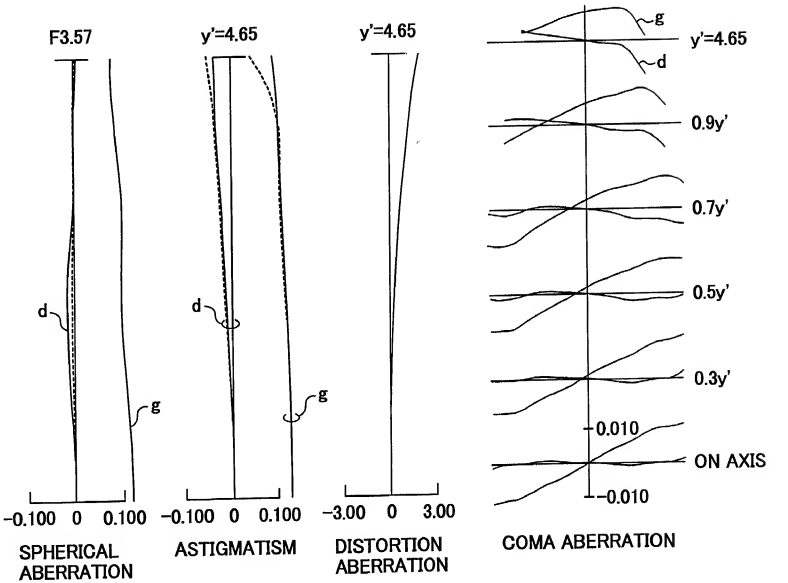


FIG. 21

LONG FOCAL POINT END EXP.5

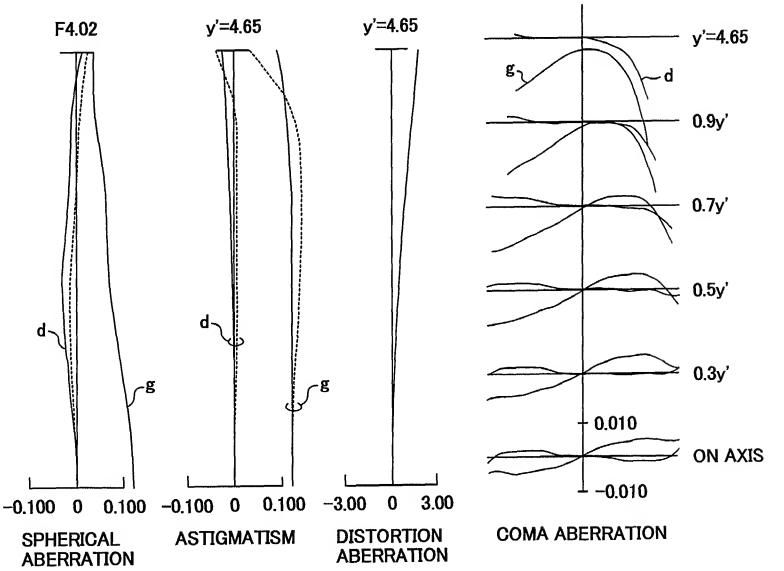


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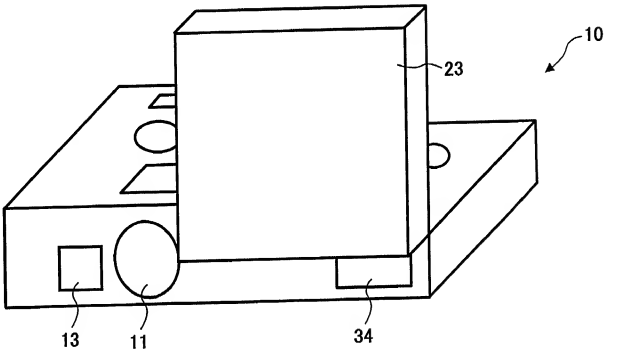
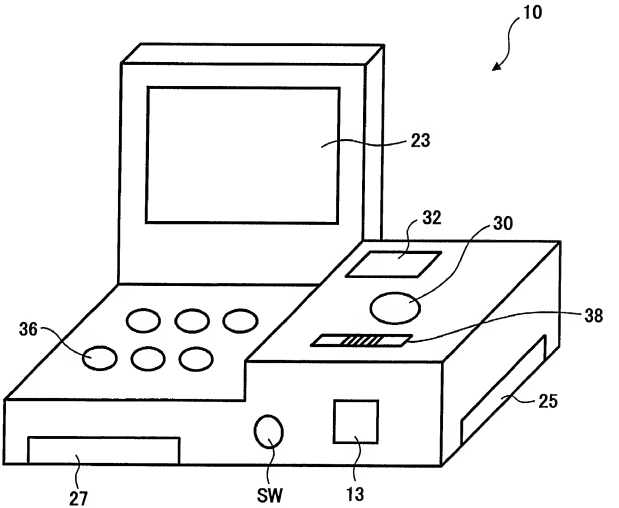
FIG. 22A



EP 2 112 654 A2 20091028

FIG. 22B



FOUNDATION

FIG. 22C

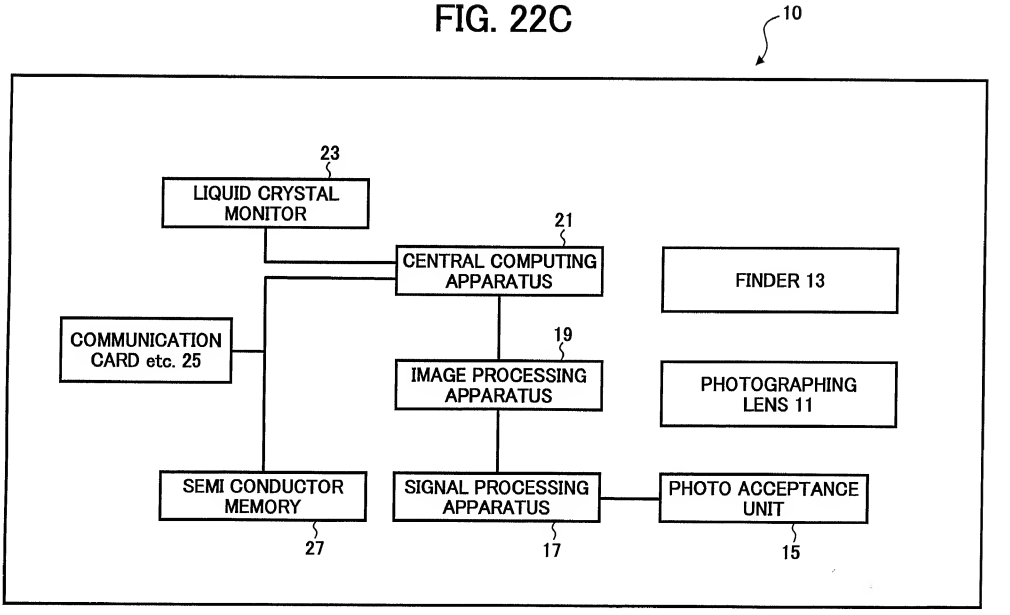
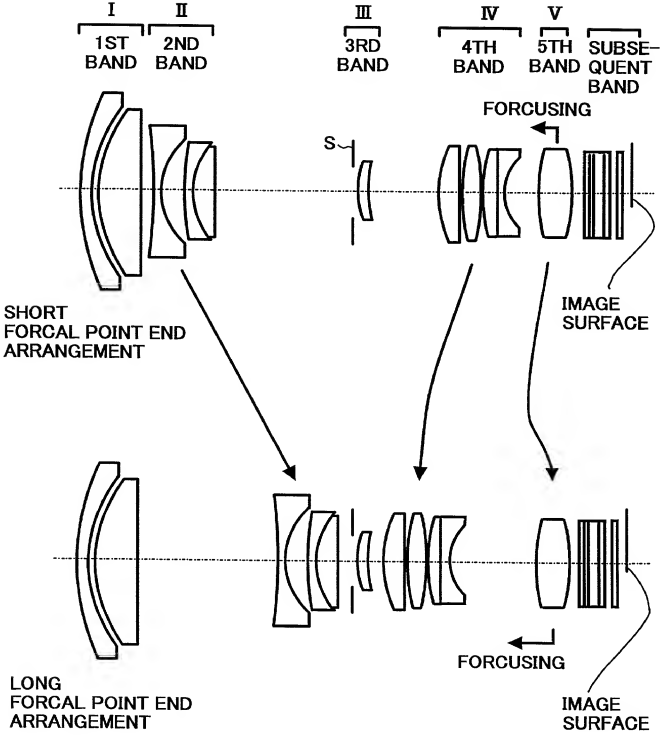


FIG. 23A


I
1ST BAND
II
2ND BAND
III
3RD BAND
IV
4TH BAND
V
5TH BAND
SUBSE-QUENT BAND
FORCUSING
S
SHORT FORCAL POINT END ARRANGEMENT
IMAGE SURFACE
LONG FORCAL POINT END ARRANGEMENT
FORCUSING
IMAGE SURFACE

09988231 - 112201

FIG. 23B

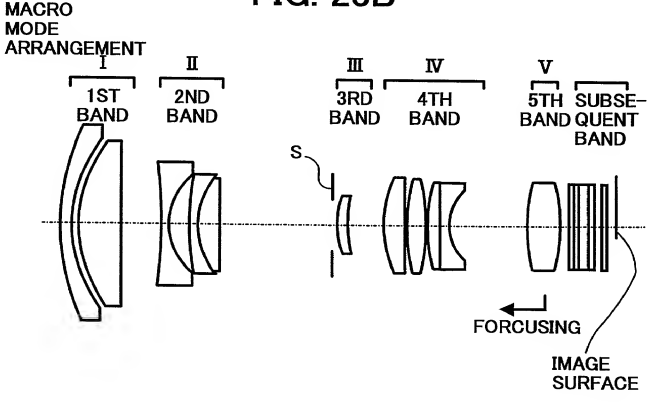
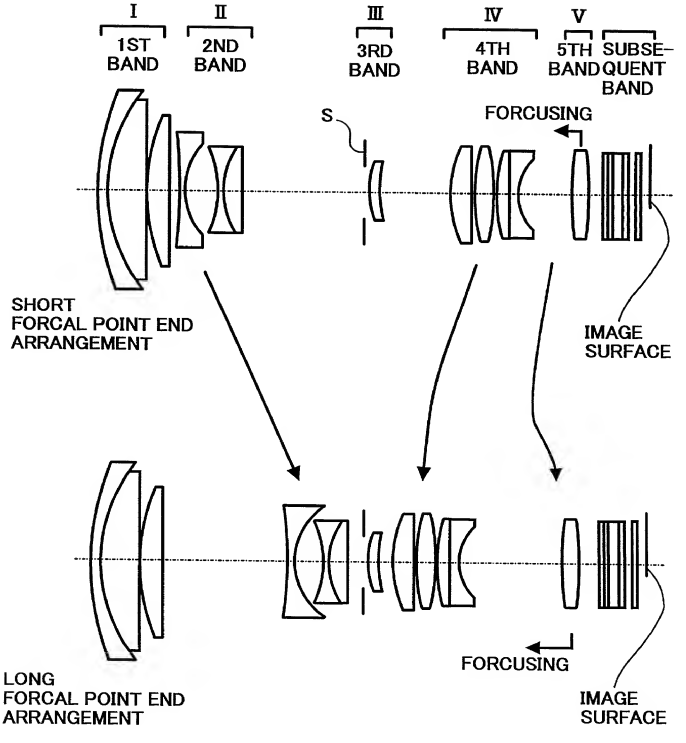


FIG. 24A



09988693 "14201"

FIG. 24B

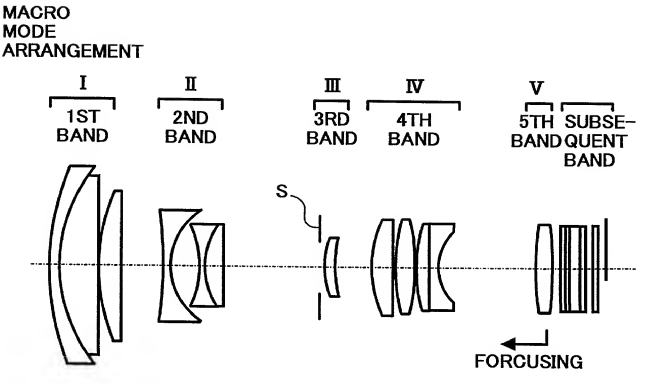

MACRO
MODE
ARRANGEMENT
I
1ST
BAND
II
2ND
BAND
III
3RD
BAND
IV
4TH
BAND
V
5TH
BAND
SUBSE-
QUENT
BAND
S
FORCUSING

FIG. 25A

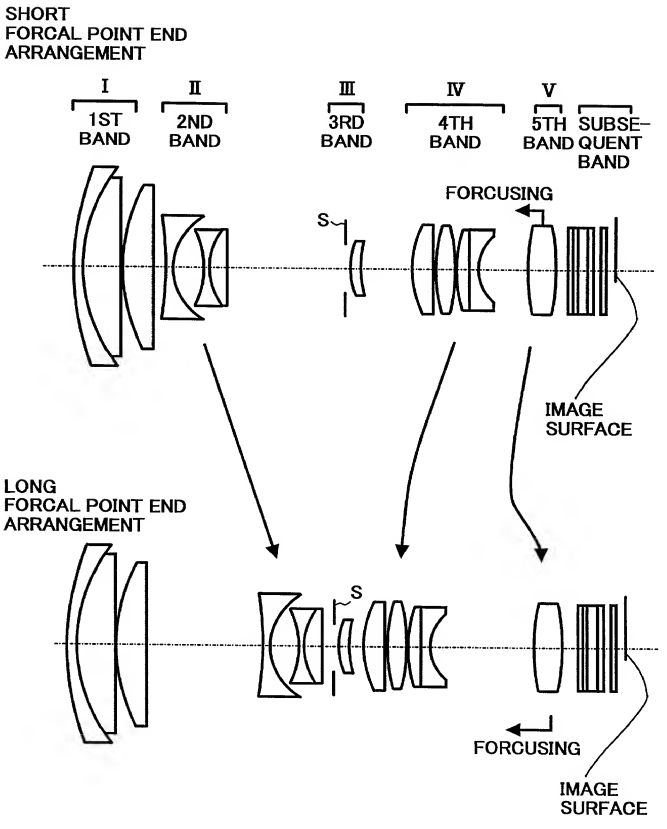
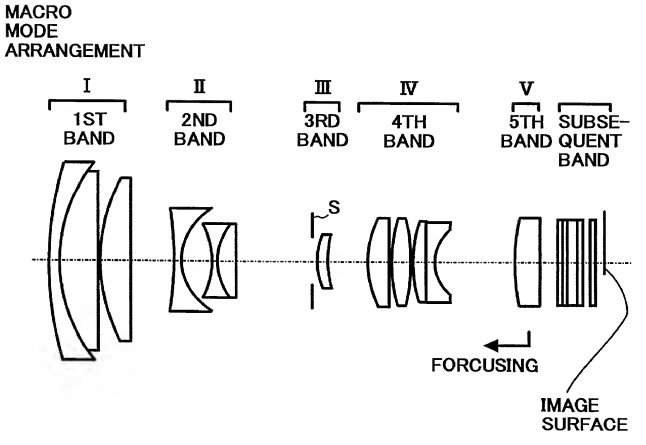

SHORT
FORCAL POINT END
ARRANGEMENT
I
1ST
BAND
II
2ND
BAND
III
3RD
BAND
IV
4TH
BAND
V
5TH
BAND
SUBSE-
QUENT
BAND
FORCUSING
S
IMAGE
SURFACE
LONG
FORCAL POINT END
ARRANGEMENT
S
FORCUSING
IMAGE
SURFACE

FIG. 25B


MACRO
MODE
ARRANGEMENT
I
1ST
BAND
II
2ND
BAND
III
3RD
BAND
IV
4TH
BAND
V
5TH
BAND
SUBSE-
QUENT
BAND
S
FORCUSING
IMAGE
SURFACE

US 2012/0069393 A1 Mar. 22, 2012

FIG. 26

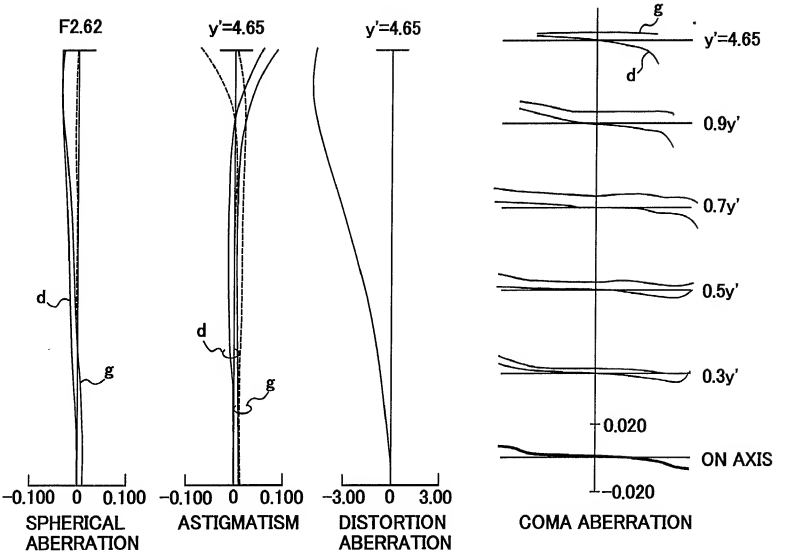


FIG. 27

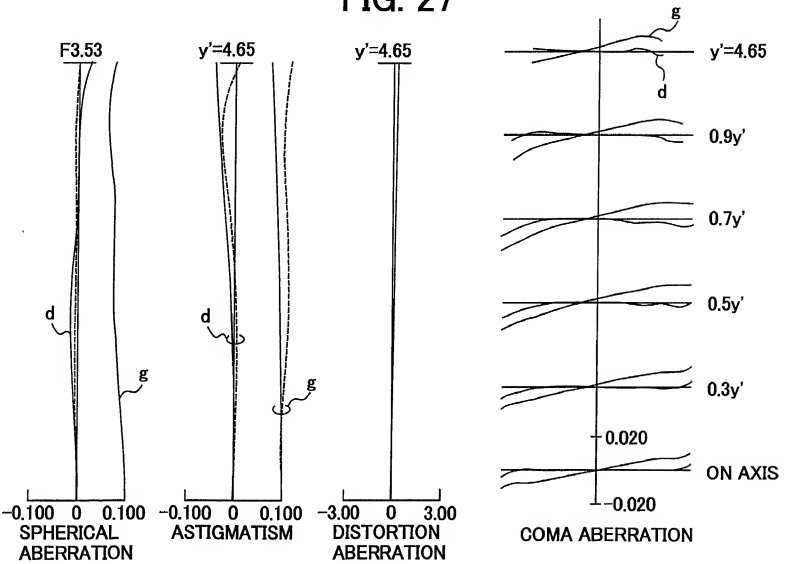
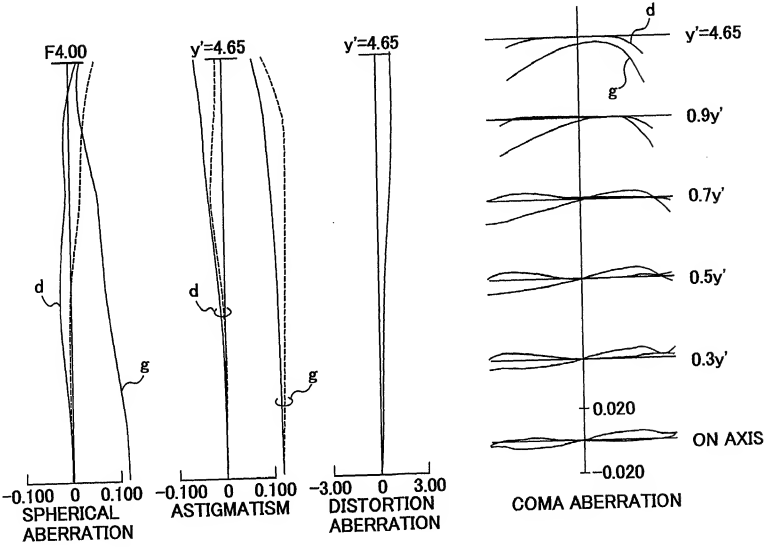

F3.53
y'=4.65
y'=4.65
d
g
d
g
-0.100 0 0.100
SPHERICAL ABERRATION
-0.100 0 0.100
ASTIGMATISM
-3.00 0 3.00
DISTORTION ABERRATION
g
y'=4.65
d
0.9y'
0.7y'
0.5y'
0.3y'
0.020
ON AXIS
-0.020
COMA ABERRATION

FIG. 28


F4.00
d
g
-0.100 0 0.100
SPHERICAL ABERRATION
y'=4.65
d
g
-0.100 0 0.100
ASTIGMATISM
y'=4.65
-3.00 0 3.00
DISTORTION ABERRATION
d
y'=4.65
g
0.9y'
0.7y'
0.5y'
0.3y'
0.020
ON AXIS
-0.020
COMA ABERRATION

09988793 .112001

FIG. 29

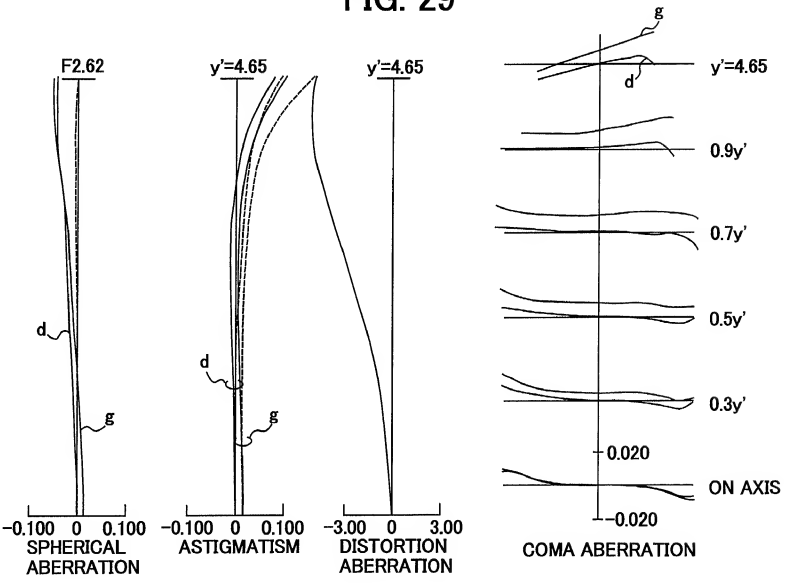


FIG. 30

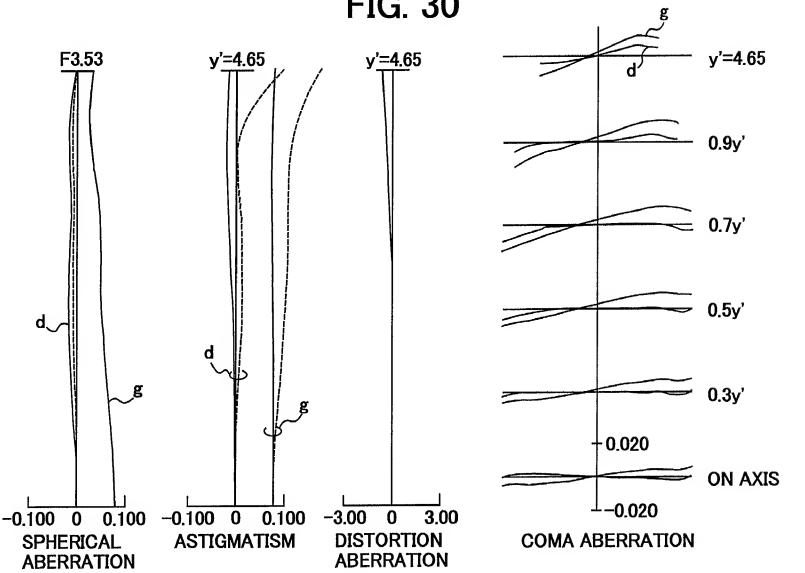

F3.53
d
g
-0.100 0 0.100
SPHERICAL ABERRATION
y'=4.65
d
g
-0.100 0 0.100
ASTIGMATISM
y'=4.65
-3.00 0 3.00
DISTORTION ABERRATION
g
d
y'=4.65
0.9y'
0.7y'
0.5y'
0.3y'
0.020
ON AXIS
-0.020
COMA ABERRATION

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FIG. 31

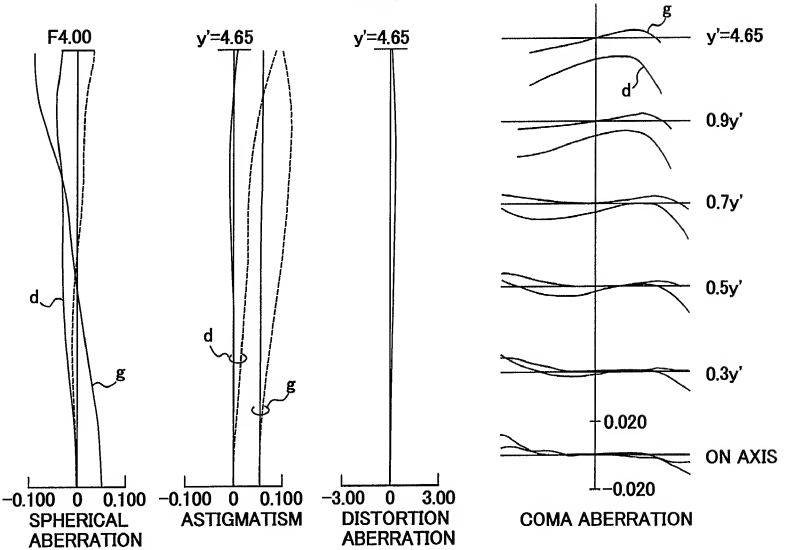


FIG. 32

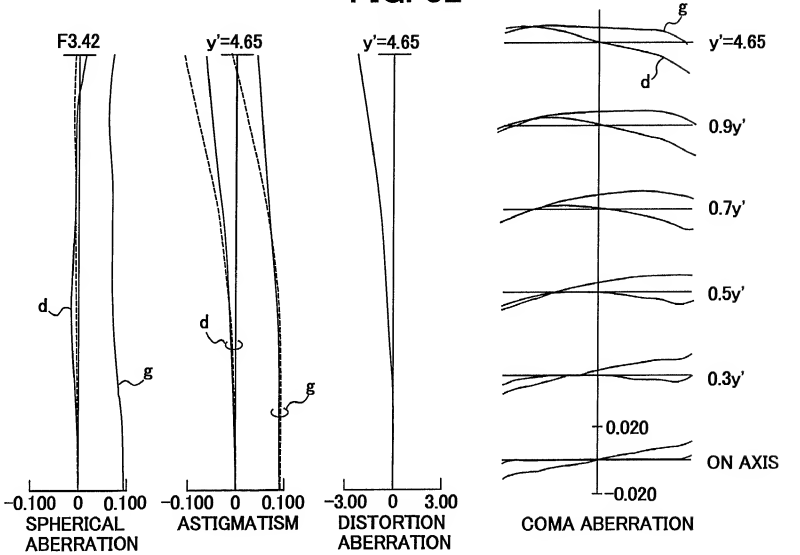

F3.42
y'=4.65
y'=4.65
d
g
d
g
-0.100 0 0.100
SPHERICAL ABERRATION
-0.100 0 0.100
ASTIGMATISM
-3.00 0 3.00
DISTORTION ABERRATION
g
y'=4.65
d
0.9y'
0.7y'
0.5y'
0.3y'
0.020
ON AXIS
-0.020
COMA ABERRATION

FIG. 33

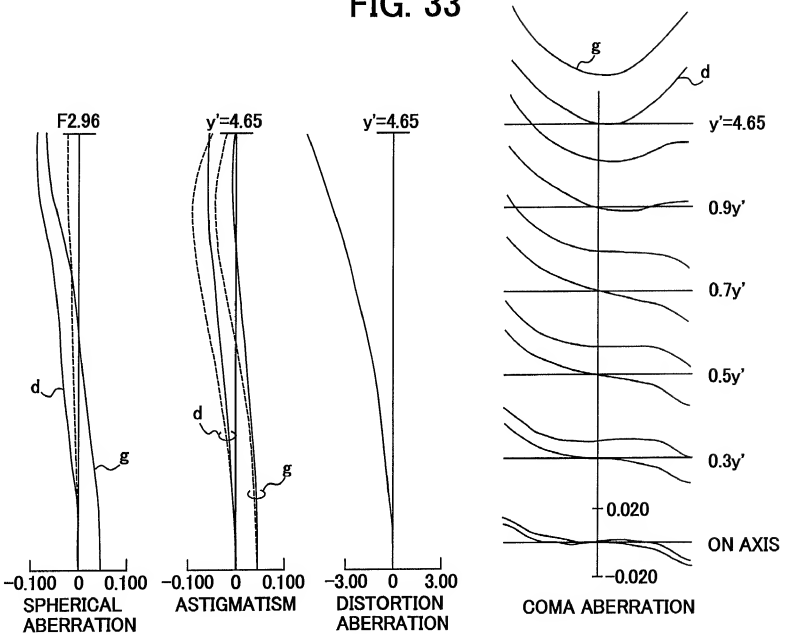
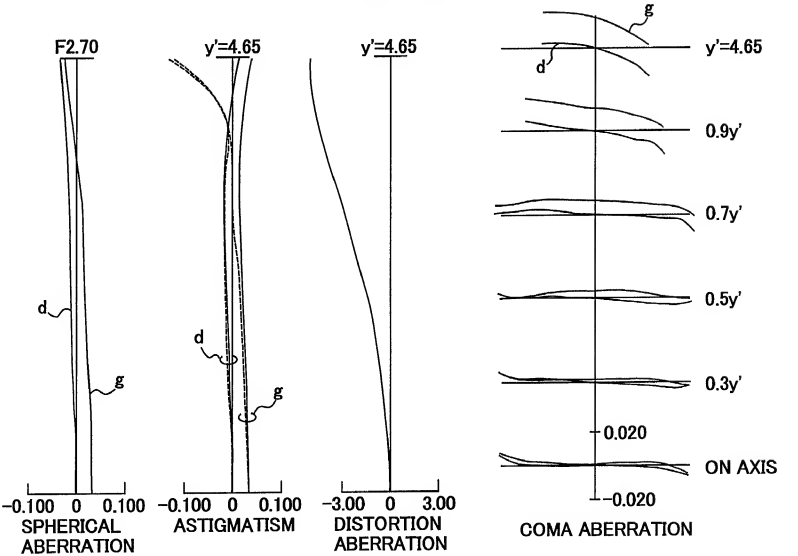
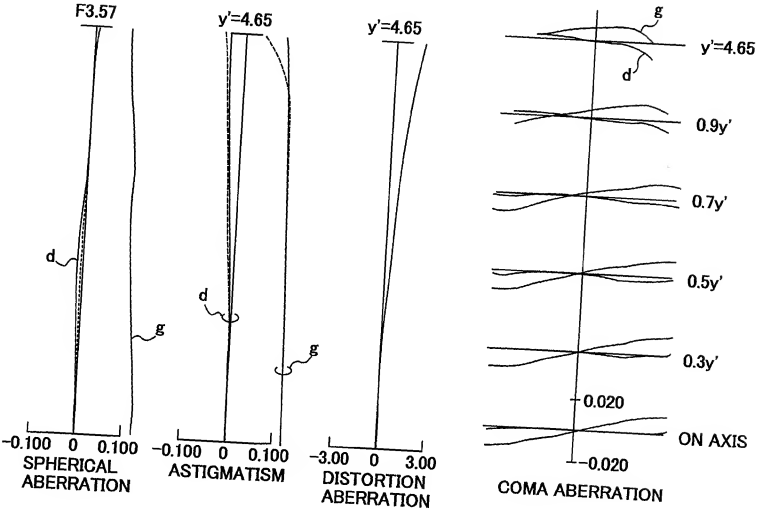

F2.96
d
g
−0.100 0 0.100
SPHERICAL ABERRATION
y'=4.65
d
g
−0.100 0 0.100
ASTIGMATISM
y'=4.65
−3.00 0 3.00
DISTORTION ABERRATION
g
d
y'=4.65
0.9y'
0.7y'
0.5y'
0.3y'
0.020
ON AXIS
−0.020
COMA ABERRATION

FIG. 34


F2.70
d
g
-0.100 0 0.100
SPHERICAL ABERRATION
y'=4.65
d
g
-0.100 0 0.100
ASTIGMATISM
y'=4.65
-3.00 0 3.00
DISTORTION ABERRATION
g
d
y'=4.65
0.9y'
0.7y'
0.5y'
0.3y'
0.020
ON AXIS
-0.020
COMA ABERRATION

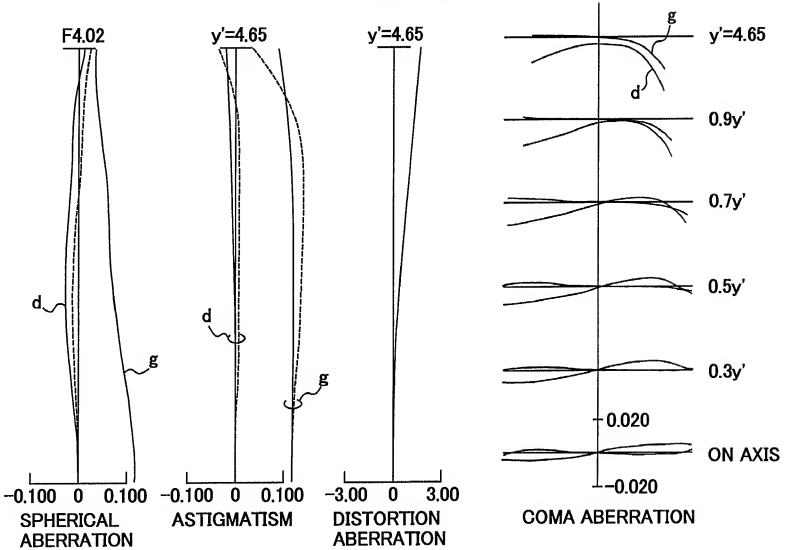
TOUCH-EG788660

FIG. 35



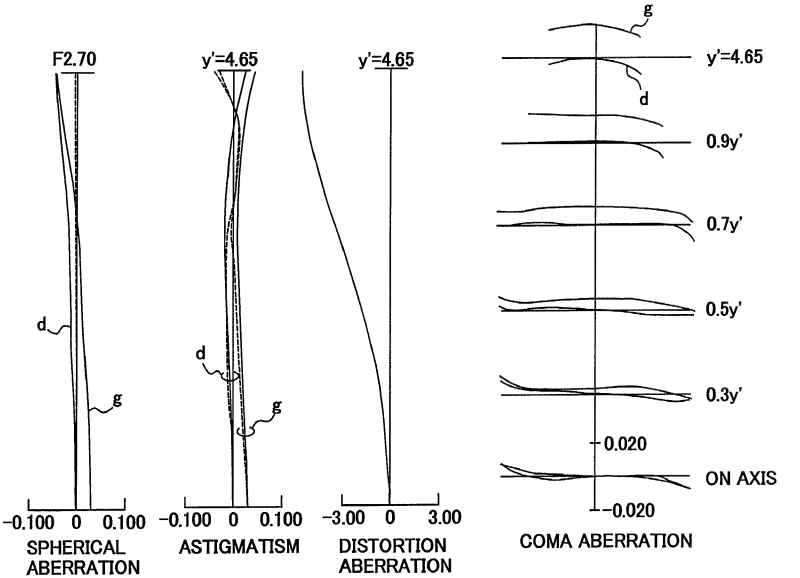
US 6,788,460 B2 Jul. 20, 2004

FIG. 36



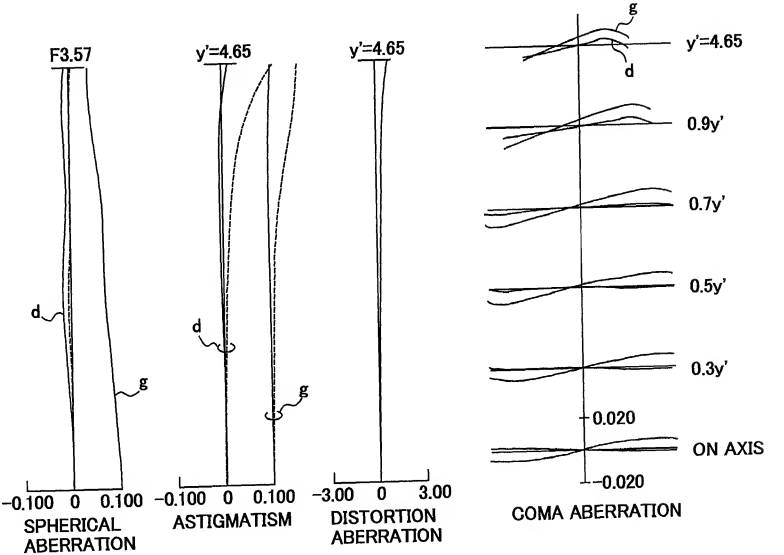
US 2002/0088660 A1

FIG. 37



US 2011/0268360 A1

FIG. 38



FOURTH EXHIBIT

FIG. 39

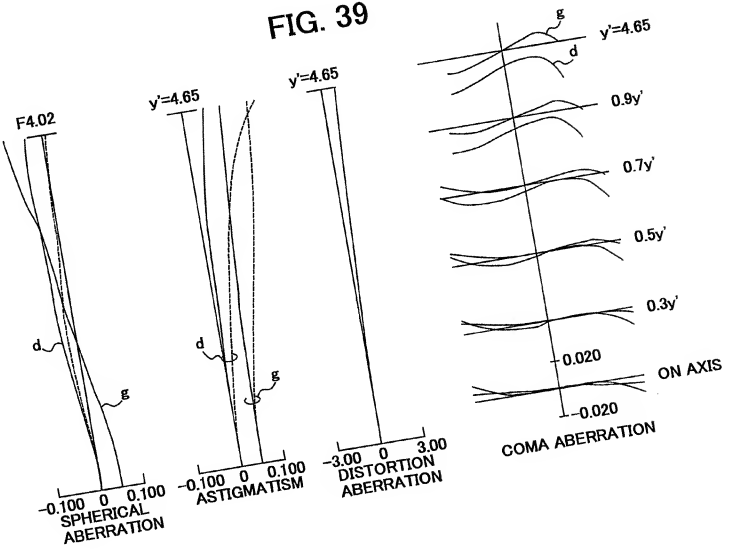


FIG. 40

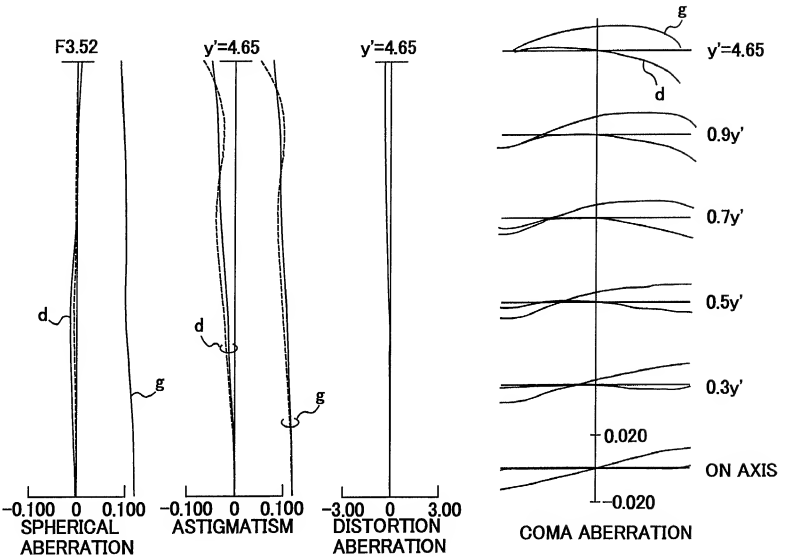

F3.52
y'=4.65
y'=4.65
d
g
d
g
-0.100 0 0.100
SPHERICAL ABERRATION
-0.100 0 0.100
ASTIGMATISM
-3.00 0 3.00
DISTORTION ABERRATION
g
y'=4.65
d
0.9y'
0.7y'
0.5y'
0.3y'
0.020
ON AXIS
-0.020
COMA ABERRATION

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FIG. 41

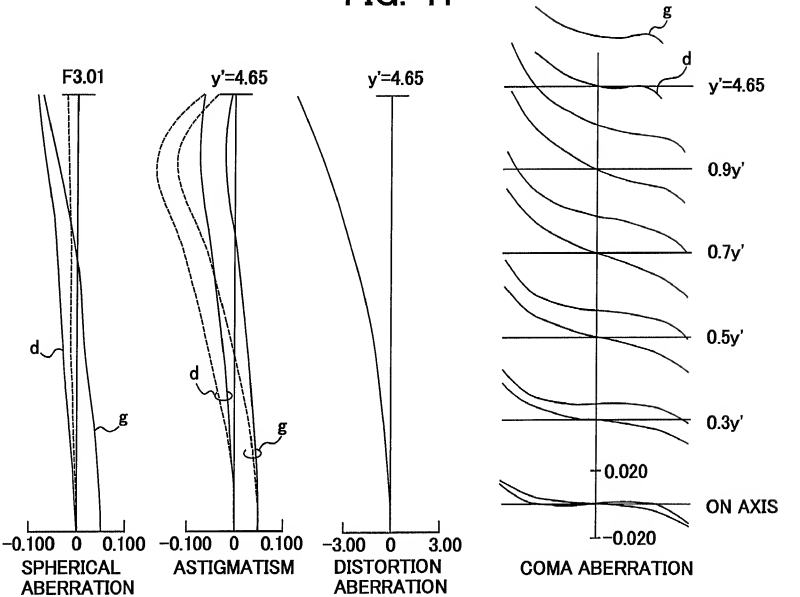
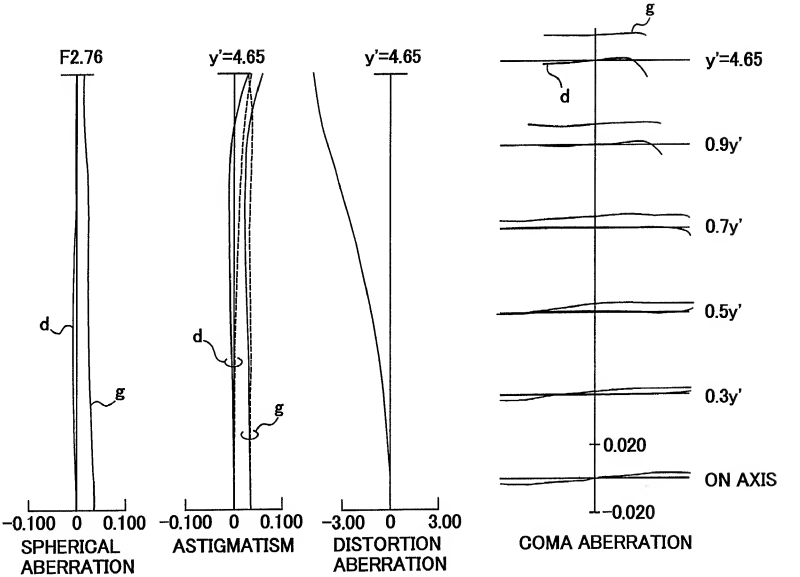
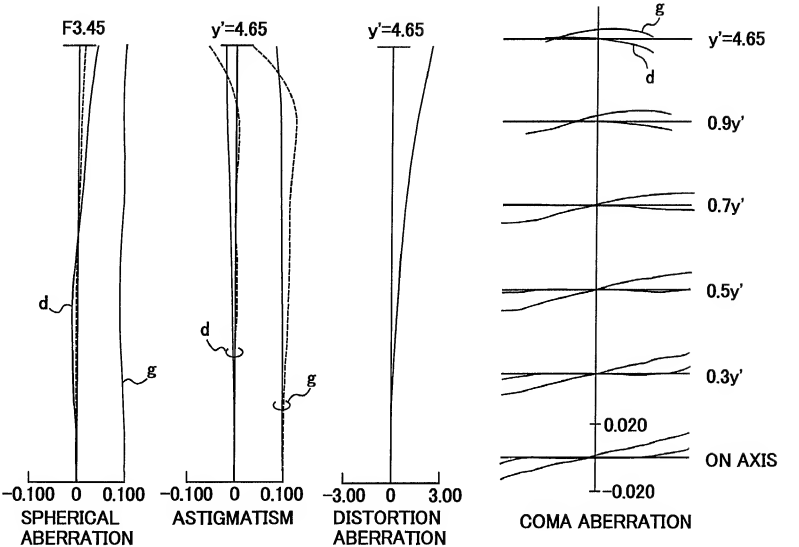


FIG. 42


F2.76
y'=4.65
y'=4.65
d
g
d
g
-0.100 0 0.100
SPHERICAL ABERRATION
-0.100 0 0.100
ASTIGMATISM
-3.00 0 3.00
DISTORTION ABERRATION
g
y'=4.65
d
0.9y'
0.7y'
0.5y'
0.3y'
0.020
ON AXIS
-0.020
COMA ABERRATION

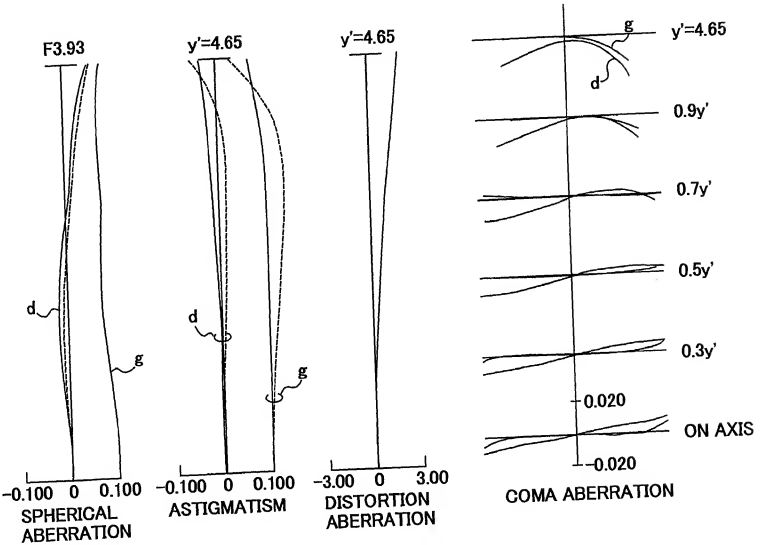
09688793 .112001

FIG. 43



09988793.112001

FIG. 44



09988793 .112004

FIG. 45

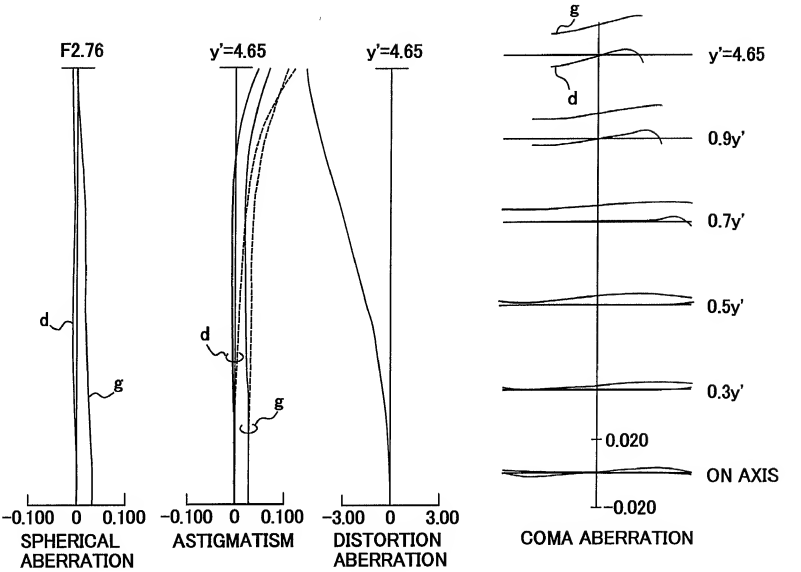


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FIG. 46

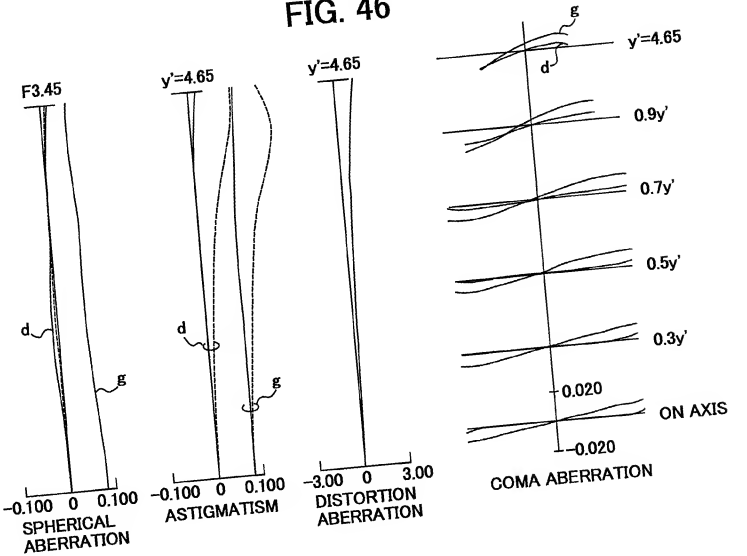

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FIG. 47

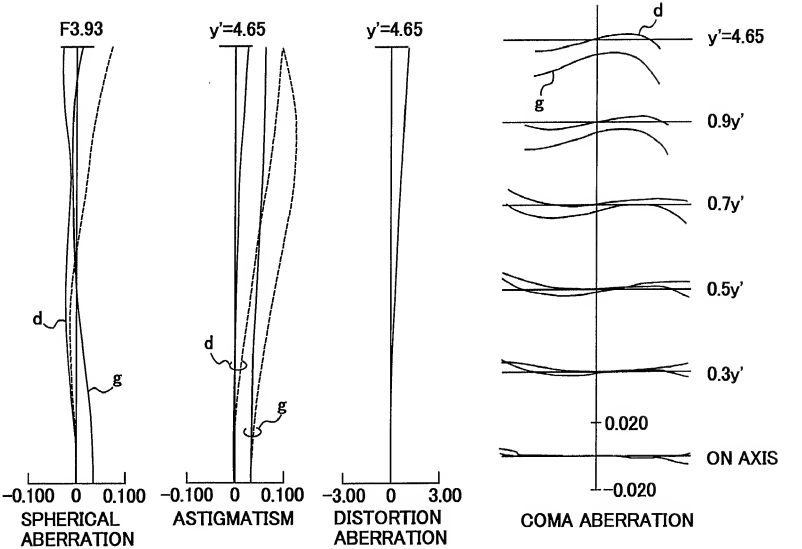
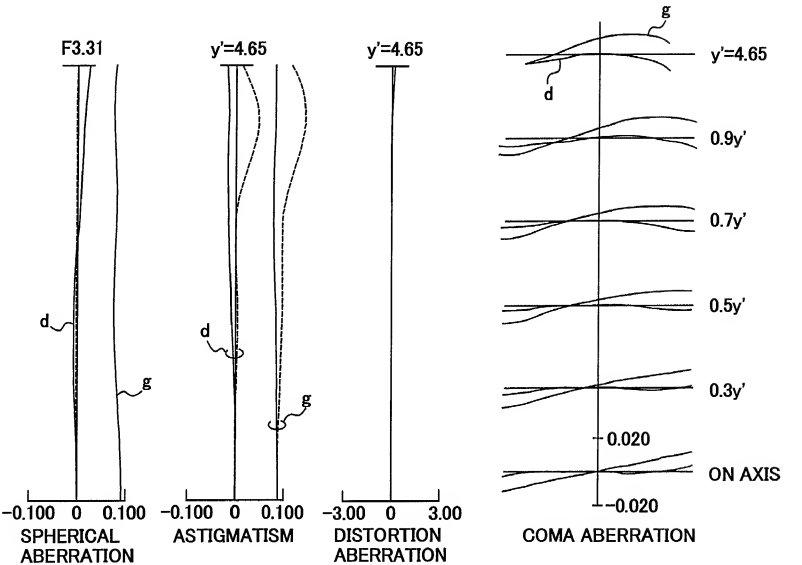


FIG. 48


F3.31
y'=4.65
y'=4.65
d
g
d
g
−0.100 0 0.100
SPHERICAL ABERRATION
−0.100 0 0.100
ASTIGMATISM
−3.00 0 3.00
DISTORTION ABERRATION
g
d
y'=4.65
0.9y'
0.7y'
0.5y'
0.3y'
0.020
ON AXIS
−0.020
COMA ABERRATION

09588793 .112001

FIG. 49

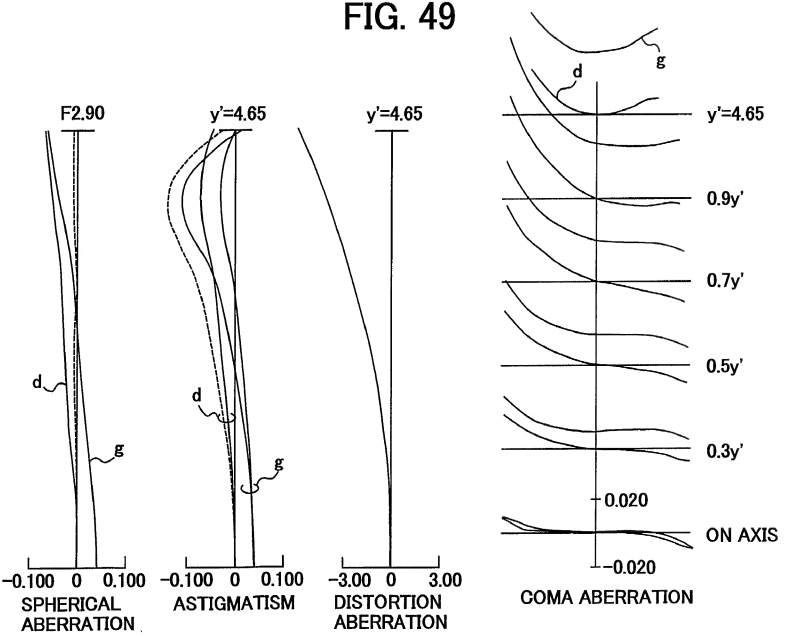


FIG. 50A

TABLE 1A

f=7.52～35.41, F=2.78～4.02, ω=32.88～7.35

SURFACE NUMBER	R	D	Nd	νd	REMARKS
01	26.655	1.20	1.84666	23.78	1st LENS
02	15.449	0.86			
03	16.227	4.67	1.77250	49.62	2nd LENS
04	−690.022	▲A			
05*	−40.171	1.00	1.77250	49.62	3rd LENS
06	11.901	2.28			
07*	−90.809	0.80	1.77250	49.62	4th LENS
08	11.495	0.10			
09	11.044	2.13	1.84666	23.78	5th LENS
10	62.549	▲B			
11	DIAPHRAGM	0.50			
12*	9.691	1.20	1.48749	70.44	6th LENS
13	16.569	▲C			
14*	16.186	2.04	1.62299	58.12	7th LENS
15	−21.031	0.10			
16	12.470	1.84	1.71300	53.94	8th LENS
17	−582.751	4.37	1.80518	25.46	9th LENS
18	6.332	▲D			
19*	12.416	2.11	1.58913	61.25	10th LENS
20	181.185	OPTION			
21	∞	3.332	1.51680	64.20	VARIETY OF FILTERS
22	∞				

▲A: VARIABLE(A)
▲B: VARIABLE(B)
▲C: VARIABLE(C)
▲D: VARIABLE(D)

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FIG. 50B

TABLE 1B

NON-SPHERICAL SURFACE OF 5th SURFACE $K=0.0,\ A_4=5.33251\times10^{-5}\ A_6=1.60356\times10^{-6}\ A_8=-1.65292\times10^{-8}$ $A_{10}=9.523698\times10^{-11}$
NON-SPHERICAL SURFACE OF 7th SURFACE $K=-5.00470,\ A_4=-2.37368\times10^{-5}\ A_6=-2.56706\times10^{-6}\ A_8=-2.81710\times10^{-8}$ $A_{10}=1.37805\times10^{-11}$
NON-SPHERICAL SURFACE OF 12th SURFACE $K=-1.96407,\ A_4=1.55199\times10^{-4}\ A_6=-6.14819\times10^{-6}\ A_8=5.61905\times10^{-7}$ $A_{10}=-2.19665\times10^{-8}$
NON-SPHERICAL SURFACE OF 14th SURFACE $K=-2.41495,\ A_4=-6.33751\times10^{-5}\ A_6=1.38599\times10^{-6}\ A_8=-8.42773\times10^{-8}$ $A_{10}=1.83313\times10^{-4}$
NON-SPHERICAL SURFACE OF 19th SURFACE $K=0.0,\ A_4=3.25504\times10^{-5}\ A_6=-1.10948\times10^{-6}\ A_8=9.67180\times10^{-8}$ $A_{10}=-1.28197\times10^{-9}$

TABLE 1C
VARIABLE INTERVAL

	SHORT FOCAL POINT END f=7.52	MIDDLE FOCAL LENGTH f=16.32	LONG FOCAL POINT END f=35.41
A	1.000	8.525	14.979
B	15.595	8.070	1.616
C	8.078	4.388	1.500
D	3.854	7.544	10.432

TABLE 1D
PARAMETER VALUE OF
CONDITIONAL EXPRESSION

$(D_{3W}-D_{3T})/(D_{1T}-D_{1W})=0.47$
$(f_{12T}/f_1)=-1.090$
$(f_{12T}/f_{12W})/(f_T/f_W)=0.537$

TABLE 1E
FOCAL LENGTH & VARIABLE INTERVALS WHEN MAGNIFICATION FROM SHORT TO LONG FOCAL POINT ENDS IS PERFORMED AND THE 4TH LENS BAND IS CLOSEST TO THE 3RD LENS BAND

f:32.861,	A:14.155,	B:2.440,	C:1.350,	D:10.582

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FIG. 51A

TABLE 2A

f=7.52～35.42, F=2.68～4.02, ω=32.96～7.32

SURFACE NUMBER	R	D	Nd	νd	REMARKS
01	26.120	1.20	1.84666	23.78	1st LENS
02	15.408	0.73			
03	16.082	4.44	1.77250	49.62	2nd LENS
04	−2461.477	▲A			
05*	−53.574	1.00	1.80610	40.73	3rd LENS
06	11.021	2.33			
07*	−189.253	0.80	1.69350	53.34	4th LENS
08	9.727	0.11			
09	9.808	2.22	1.84666	23.78	5th LENS
10	43.589	▲B			
11	DIAPHRAGM	0.50			
12*	10.080	1.19	1.48749	70.44	6th LENS
13	17.824	▲C			
14*	14.261	2.45	1.58913	61.25	7th LENS
15	−21.061	0.10			
16	11.627	2.45	1.70514	41.15	8th LENS
17	−33.441	2.88	1.80518	25.46	9th LENS
18	6.497	▲D			
19*	10.344	1.98	1.58913	61.25	10th LENS
20	33.975	OPTION			
21	∞	3.332	1.51680	64.20	VARIETY OF FILTERS
22	∞				

▲A: VARIABLE(A)
▲B: VARIABLE(B)
▲C: VARIABLE(C)
▲D: VARIABLE(D)

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FIG. 51B

TABLE 2B

NON-SPHERICAL SURFACE OF 5th SURFACE $K=0.0$, $A_4=3.77213\times10^{-5}$ $A_6=1.03690\times10^{-6}$ $A_8=1.11273\times10^{-8}$ $A_{10}=6.33905\times10^{-11}$
NON-SPHERICAL SURFACE OF 7th SURFACE $K=0.0$, $A_4=9.35662\times10^{-6}$ $A_6=-2.41906\times10^{-6}$ $A_8=5.93970\times10^{-9}$ $A_{10}=-3.64847\times10^{-10}$
NON-SPHERICAL SURFACE OF 12th SURFACE $K=-2.14178$, $A_4=1.44251\times10^{-4}$ $A_6=-4.77086\times10^{-6}$ $A_8=4.23771\times10^{-7}$ $A_{10}=-1.74996\times10^{-8}$
NON-SPHERICAL SURFACE OF 14th SURFACE $K=-1.75847$, $A_4=-4.69337\times10^{-5}$ $A_6=5.28273\times10^{-7}$ $A_8=-2.09994\times10^{-8}$ $A_{10}=3.06349\times10^{-10}$
NON-SPHERICAL SURFACE OF 19th SURFACE $K=0.0$, $A_4=-3.92832\times10^{-5}$ $A_6=-4.61773\times10^{-7}$ $A_8=8.17517\times10^{-6}$ $A_{10}=-1.25985\times10^{-9}$

TABLE 2C
VARIABLE INTERVAL

	SHORT FOCAL POINT END f=7.52	MIDDLE FOCAL LENGTH f=16.33	LONG FOCAL POINT END f=35.42
A	1.000	8.620	14.603
B	15.257	7.636	1.654
C	8.946	5.131	1.500
D	3.196	7.057	11.587

TABLE 2D
PARAMETER VALUE OF
CONDITIONAL EXPRESSION

$(D_{3W}-D_{3T})/(D_{1T}-D_{1W})=0.55$
$(f_{12T}/f_I)=-1.086$
$(f_{12T}/f_{12W})/(f_T/f_W)=0.523$

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FIG. 52A

TABLE 3A

f=7.52～42.48, F=2.38～4.00, ω=33.10～6.12

SURFACE NUMBER	R	D	Nd	νd	REMARKS
01	31.036	1.02	1.84666	23.78	1st LENS
02	17.869	1.41			
03	19.260	4.17	1.77250	49.62	2nd LENS
04	−267.057	▲A			
05*	−43.607	1.00	1.83500	42.98	3rd LENS
06	11.134	2.45			
07*	−378.543	0.80	1.74330	49.22	4th LENS
08	14.455	0.10			
09	13.436	2.30	1.84666	23.78	5th LENS
10	339.694	▲B			
11	DIAPHRAGM	0.50			
12*	11.208	1.21	1.48749	70.44	6th LENS
13	17.548	▲C			
14*	16.335	2.80	1.62299	58.12	7th LENS
15	−30.357	0.10			
16	16.543	3.24	1.77250	49.62	8th LENS
17	−17.522	2.43	1.71736	29.50	9th LENS
18	7.459	▲D			
19*	9.682	2.25	1.48749	70.44	10th LENS
20	30.238	OPTION			
21	∞	3.332	1.51680	64.20	VARIETY OF FILTERS
22	∞				

▲A: VARIABLE(A)
▲B: VARIABLE(B)
▲C: VARIABLE(C)
▲D: VARIABLE(D)

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FIG. 52B

TABLE 3B

NON-SPHERICAL SURFACE OF 5th SURFACE $K=0.0$, $A_4=5.12563\times10^{-5}$ $A_6=1.60220\times10^{-7}$ $A_8=6.03181\times10^{-11}$ $A_{10}=-5.54096\times10^{-12}$
NON-SPHERICAL SURFACE OF 7th SURFACE $K=-2372.29$, $A_4=8.29144\times10^{-6}$ $A_6=-3.62960\times10^{-7}$ $A_8=-1.18221\times10^{-8}$ $A_{10}=-6.64935\times10^{-11}$
NON-SPHERICAL SURFACE OF 12th SURFACE $K=-2.54795$, $A_4=1.30168\times10^{-4}$ $A_6=-9.63887\times10^{-7}$ $A_8=7.57566\times10^{-9}$ $A_{10}=-2.29717\times10^{-11}$
NON-SPHERICAL SURFACE OF 14th SURFACE $K=-1.25642$, $A_4=-4.03456\times10^{-5}$ $A_6=4.01824\times10^{-8}$ $A_8=-1.74724\times10^{-9}$ $A_{10}=1.17398\times10^{-11}$
NON-SPHERICAL SURFACE OF 19th SURFACE $K=0.0$, $A_4=-4.24707\times10^{-5}$ $A_6=5.03298\times10^{-7}$ $A_8=2.74980\times10^{-9}$ $A_{10}=3.15192\times10^{-11}$

TABLE 3C

VARIABLE INTERVAL

	SHORT FOCAL POINT END f=7.52	MIDDLE FOCAL LENGTH f=17.88	LONG FOCAL POINT END f=42.48
A	1.000	10.341	17.787
B	18.311	8.970	1.524
C	12.515	6.527	1.500
D	3.171	10.194	16.950

TABLE 3D

PARAMETER VALUE OF CONDITIONAL EXPRESSION

$(D_{3W}-D_{3T})/(D_{1T}-D_{1W})=0.66$
$(f_{12T}/f_1)=-1.144$
$(f_{12T}/f_{12W})/(f_T/f_W)=0.465$

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FIG. 53A

TABLE 4A

f=7.52～35.42, F=2.62～4.00, ω=32.99～7.41

SURFACE NUMBER	R	D	Nd	νd	REMARKS
01	26.529	1.20	1.84666	23.78	1st LENS
02	15.607	1.17			
03	16.702	4.36	1.77250	49.62	2nd LENS
04	−371.916	▲A			
05*	−29.404	1.00	1.80610	40.73	3rd LENS
06	8.571	2.20			
07	32.023	0.80	1.54072	47.20	4th LENS
08	8.557	2.49	1.84666	23.78	5th LENS
09	30.960	▲B			
10	DIAPHRAGM	0.50			
11*	7.674	1.10	1.58913	61.25	6th LENS
12	8.158	▲C			
13*	10.021	2.54	1.58913	61.25	7th LENS
14*	−63.691	0.10			
15	15.867	2.15	1.48749	70.44	8th LENS
16	−50.882	0.10			
17	12.522	1.82	1.59913	61.25	9th LENS
18	76.837	0.80	1.80518	25.46	10th LENS
19	5.641	▲D			
20	18.992	3.37	1.60342	38.01	11th LENS
21*	−47.165	OPTION			
22	∞	3.214	1.51680	64.20	VARIETY OF FILTERS
23	∞				

▲A: VARIABLE(A)
▲B: VARIABLE(B)
▲C: VARIABLE(C)
▲D: VARIABLE(D)

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FIG. 53B

TABLE 4B

NON-SPHERICAL SURFACE OF 5th SURFACE $K=0.0,\ A_4=1.37015\times10^{-4}\ A_6=-9.81958\times10^{-7}\ A_8=9.21207\times10^{-9}$ $A_{10}=-4.92691\times10^{-11}$
NON-SPHERICAL SURFACE OF 11th SURFACE $K=-1.20196,\ A_4=2.83724\times10^{-4}\ A_6=-6.86713\times10^{-6}\ A_8=9.48847\times10^{-7}$ $A_{10}=-3.87184\times10^{-6}$
NON-SPHERICAL SURFACE OF 13th SURFACE $K=-1.13642,\ A_4=6.34825\times10^{-6}\ A_6=2.90033\times10^{-6}\ A_8=-3.90207\times10^{-8}$ $A_{10}=1.09626\times10^{-10}$
NON-SPHERICAL SURFACE OF 14th SURFACE $K=-70.9456,\ A_4=6.79619\times10^{-11}\ A_6=3.00428\times10^{-6}\ A_8=-3.35316\times10^{-8}$ $A_{10}=-1.72607\times10^{-10}$
NON-SPHERICAL SURFACE OF 21th SURFACE $K=14.57109,\ A_4=-5.21909\times10^{-5}\ A_6=-3.69390\times10^{-6}\ A_8=7.04367\times10^{-8}$ $A_{10}=-6.33661\times10^{-10}$

TABLE 4C
VARIABLE INTERVAL

	SHORT FOCAL POINT END f=7.52	MIDDLE FOCAL LENGTH f=16.33	LONG FOCAL POINT END f=35.42
A	1.530	8.117	15.363
B	15.770	9.183	1.937
C	8.000	3.409	1.500
D	3.964	9.176	11.332

TABLE 4D
PARAMETER VALUE OF
CONDITIONAL EXPRESSION

$(D_{3W}-D_{3T})/(D_{1T}-D_{1W})=0.47$
$(f_{12T}/f_1)=-1.308$
$(f_{12T}/f_{12W})/(f_T/f_W)=0.565$

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FIG. 54A

TABLE 5A

f=7.52～35.42, F=2.70～4.02, ω=33.09～7.35

SURFACE NUMBER	R	D	Nd	νd	REMARKS
01	39.389	1.20	1.84666	23.78	1st LENS
02	20.025	3.88			
03	158.989	0.10	1.53172	48.84	2nd LENS
04	26.736	2.70	1.77250	49.62	3rd LENS
05	578.390	▲A			
06*	−71.421	1.00	1.80610	40.73	4th LENS
07*	8.802	3.05			
08	−16.232	0.80	1.51742	52.15	5th LENS
09	11.846	2.06	1.84666	23.78	6th LENS
10	∞	▲B			
11	DIAPHRAGM	0.50			
12*	7.657	1.12	1.58913	61.25	7th LENS
13	8.381	▲C			
14*	9.908	2.63	1.58913	61.25	8th LENS
15*	−40.037	0.11			
16	38.816	2.12	1.48749	70.44	9th LENS
17	−18.714	0.18			
18	15.283	1.87	1.58913	61.25	10th LENS
19	−112.371	1.17	1.80518	25.46	11th LENS
20	6.199	▲D			
21	17.732	1.96	1.64769	33.84	12th LENS
22*	−121.961	OPTION			
23	∞	3.214	1.51680	64.20	VARIETY OF FILTERS
24	∞				

▲A: VARIABLE(A)
▲B: VARIABLE(B)
▲C: VARIABLE(C)
▲D: VARIABLE(D)

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FIG. 54B

TABLE 5B

NON-SPHERICAL SURFACE OF 6th SURFACE K=0.0, $A_4=9.14684\times10^{-5}$ $A_6=-9.34472\times10^{-7}$ $A_8=1.42322\times10^{-8}$ $A_{10}=-1.17627\times10^{-10}$
NON-SPHERICAL SURFACE OF 7th SURFACE K=0.09374, $A_4=2.75961\times10^{-5}$ $A_6=1.27476\times10^{-6}$ $A_8=1.62751\times10^{-8}$ $A_{10}=7.41921\times10^{-10}$
NON-SPHERICAL SURFACE OF 12th SURFACE K=-1.26140, $A_4=2.67355\times10^{-4}$ $A_6=-6.25917\times10^{-6}$ $A_8=8.12274\times10^{-7}$ $A_{10}=-3.08665\times10^{-8}$
NON-SPHERICAL SURFACE OF 14th SURFACE K=-1.30919, $A_4=-1.18876\times10^{-5}$ $A_6=2.33312\times10^{-6}$ $A_8=-1.34009\times10^{-8}$ $A_{10}=-4.54838\times10^{-10}$
NON-SPHERICAL SURFACE OF 15th SURFACE K=-46.11855, $A_4=7.30394\times10^{-5}$ $A_6=3.24821\times10^{-6}$ $A_8=-2.36224\times10^{-8}$ $A_{10}=-5.40644\times10^{-10}$
NON-SPHERICAL SURFACE OF 22th SURFACE K=45.76087, $A_4=-5.63924\times10^{-5}$ $A_6=-2.40860\times10^{-6}$ $A_8=7.82626\times10^{-8}$ $A_{10}=-1.12266\times10^{-9}$

TABLE 5C
VARIABLE INTERVAL

	SHORT FOCAL POINT END f=7.52	MIDDLE FOCAL LENGTH f=16.33	LONG FOCAL POINT END f=35.42
A	1.239	7.297	13.763
B	14.024	7.966	1.500
C	8.000	3.593	1.500
D	3.950	10.036	11.215

TABLE 5D
PARAMETER VALUE OF
CONDITIONAL EXPRESSION

$(D_{3W}-D_{3T})/(D_{1T}-D_{1W})=0.52$
$(f_{12T}/f_1)=-1.223$
$(f_{12T}/f_{12W})/(f_T/f_W)=0.559$

FIG. 55A

TABLE 6A
f=7.52～35.42, F=2.62～4.00, ω=32.99～7.41

SURFACE NUMBER	R	D	Nd	νd	REMARKS
01	26.529	1.20	1.84666	23.78	1st LENS
02	15.607	1.17			
03	16.702	4.36	1.77250	49.62	2nd LENS
04	−371.916	▲A			
05*	−29.404	1.00	1.80610	40.73	3rd LENS
06	8.571	2.20			
07	32.023	0.80	1.54072	47.20	4th LENS
08	8.557	2.49	1.84666	23.78	5th LENS
09	30.960	▲B			
10	DIAPHRAGM	0.50			
11*	7.674	1.10	1.58913	61.25	6th LENS
12	8.158	▲C			
13*	10.021	2.54	1.58913	61.25	7th LENS
14*	−63.691	0.10			
15	15.867	2.15	1.48749	70.44	8th LENS
16	−50.882	0.10			
17	12.522	1.82	1.59913	61.25	9th LENS
18	76.837	0.80	1.80518	25.46	10th LENS
19	5.641	▲D			
20	18.992	3.37	1.60342	38.01	11th LENS
21*	−47.165	OPTION			
22	∞	3.214	1.51680	64.20	VARIETY OF FILTERS
23	∞				

▲A: VARIABLE(A)
▲B: VARIABLE(B)
▲C: VARIABLE(C)
▲D: VARIABLE(D)

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FIG. 55B

TABLE 6B

NON-SPHERICAL SURFACE OF 5th SURFACE $K=0.0,\ A_4=1.37015\times10^{-4}\ A_6=-9.81958\times10^{-7}\ A_8=9.21207\times10^{-9}$ $A_{10}=-4.92691\times10^{-11}$
NON-SPHERICAL SURFACE OF 11th SURFACE $K=-1.20196,\ A_4=2.83724\times10^{-4}\ A_6=-6.86713\times10^{-6}\ A_8=9.48847\times10^{-7}$ $A_{10}=-3.87184\times10^{-8}$
NON-SPHERICAL SURFACE OF 13th SURFACE $K=-1.13642,\ A_4=6.34825\times10^{-6}\ A_6=2.90033\times10^{-6}\ A_8=-3.90207\times10^{-8}$ $A_{10}=1.09626\times10^{-10}$
NON-SPHERICAL SURFACE OF 14th SURFACE $K=-70.94256,\ A_4=6.79619\times10^{-5}\ A_6=3.00428\times10^{-6}\ A_8=-3.35316\times10^{-8}$ $A_{10}=-1.72607\times10^{-10}$
NON-SPHERICAL SURFACE OF 21th SURFACE $K=14.57109,\ A_4=-5.21909\times10^{-5}\ A_6=-3.69390\times10^{-6}\ A_8=7.04367\times10^{-8}$ $A_{10}=-6.33661\times10^{-10}$

TABLE 6C
VARIABLE INTERVAL:
TYPICAL PHOTOGRAPHING REGION

	AT INFIN-ITY	AT INFIN-ITY	AT INFIN-ITY	0.3m	0.4m	0.5m
	SHORT FOCAL POINT END f=7.52	MIDDLE FOCAL LINGTH f=16.33	LONG FOCAL POINT END f=35.42	SHORT FOCAL POINT END f=7.44	MIDDLE FOCAL LENGTH f=15.71	MIDDLE FOCAL POINT END f=31.60
A	1.530	8.117	15.363	1.530	8.117	15.363
B	15.770	9.183	1.937	15.770	9.183	1.937
C	8.000	3.409	1.500	8.000	3.409	1.500
D	3.964	9.176	11.332	3.571	7.896	7.438

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FIG. 55C

TABLE 6D
VARIABLE INTERVAL
IN MACRO MODE (A PHOTOGRAPHIC
DISTANCE IS FROM AN IMAGE SURFACE)

	0.3m	0.077m
	f=12.03	f=10.43
A	4.508	4.508
B	12.792	12.792
C	3.816	3.816
D	8.960	4.150

TABLE 6E
PARAMETER VALUE OF
CONDITIONAL EXPRESSION

$(L_{1C}-L_{1W})/(L_{1T}-L_{1W})=0.215$
$(L_{3C}-L_{3T})/(L_{3W}-L_{3T})=0.356$
$(D_{3W}-D_{3T})/(D_{1T}-D_{1W})=0.47$
$(f_{12T}/f_1)=-1.308$

FIG. 56A

TABLE 7A

f=7.52～35.42, F=2.70～4.02, ω=33.09～7.35

SURFACE NUMBER	R	D	Nd	νd	REMARKS
01	39.389	1.20	1.84666	23.78	1st LENS
02	20.025	3.88	1.53172	48.84	
03	158.989	0.10			2nd LENS
04	26.736	2.70	1.77250	49.62	3rd LENS
05	578.390	▲A			
06*	−71.421	1.00	1.80610	40.73	4th LENS
07*	8.802	3.05			
08	−16.232	0.80	1.51742	52.15	5th LENS
09	11.846	2.06	1.84666	23.78	6th LENS
10	∞	▲B			
11	DIAPHRAGM	0.50			
12*	7.657	1.12	1.58913	61.25	7th LENS
13	8.381	▲C			
14*	9.908	2.63	1.58913	61.25	8th LENS
15*	−40.037	0.11			
16	38.816	2.12	1.48749	70.44	9th LENS
17	−18.714	0.18			
18	15.283	1.87	1.58913	61.25	10th LENS
19	−112.371	1.17	1.80518	25.46	11th LENS
20	6.199	▲D			
21	17.732	1.96	1.64769	33.84	12th LENS
22*	−121.961	OPTION			
23	∞	3.214	1.51680	64.20	VARIETY OF FILTERS
24	∞				

▲A: VARIABLE(A)
▲B: VARIABLE(B)
▲C: VARIABLE(C)
▲D: VARIABLE(D)

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FIG. 56B

TABLE 7B

NON-SPHERICAL SURFACE OF 6th SURFACE K=0.0, $A_4=9.14684\times10^{-5}$ $A_6=-9.34472\times10^{-7}$ $A_8=1.42322\times10^{-8}$ $A_{10}=-1.17627\times10^{-10}$
NON-SPHERICAL SURFACE OF 7th SURFACE K=0.09374, $A_4=2.75961\times10^{-5}$ $A_6=1.27476\times10^{-6}$ $A_8=-1.62751\times10^{-8}$ $A_{10}=7.41921\times10^{-10}$
NON-SPHERICAL SURFACE OF 12th SURFACE K=-1.26140, $A_4=2.67355\times10^{-4}$ $A_6=-6.25917\times10^{-6}$ $A_8=8.12274\times10^{-7}$ $A_{10}=-3.08665\times10^{-8}$
NON-SPHERICAL SURFACE OF 14th SURFACE K=-1.30919, $A_4=-1.18876\times10^{-5}$ $A_6=2.33312\times10^{-6}$ $A_8=-1.34009\times10^{-8}$ $A_{10}=-4.54838\times10^{-10}$
NON-SPHERICAL SURFACE OF 15th SURFACE K=-46.11855, $A_4=7.30394\times10^{-5}$ $A_6=3.24821\times10^{-6}$ $A_8=-2.36224\times10^{-8}$ $A_{10}=-5.40644\times10^{-10}$
NON-SPHERICAL SURFACE OF 22th SURFACE K=45.76087, $A_4=-5.63924\times10^{-5}$ $A_6=-2.40860\times10^{-6}$ $A_8=7.82626\times10^{-8}$ $A_{10}=-1.12266\times10^{-9}$

TABLE 7C
VALUABLE INTERVAL:
TYPICAL PHOTOGRAPHING REGION

	AT INFIN-ITY	AT INFIN-ITY	AT INFIN-ITY	0.3m	0.4m	0.5m
	SHORT FOCAL POINT END f=7.52	MIDDLE FOCAL LENGTH f=16.33	LONG FOCAL POINT END f=35.42	SHORT FOCAL POINT END f=7.42	MIDDLE FOCAL LENGTH f=15.68	MIDDLE FOCAL POINT END f=31.93
A	1.239	7.297	13.763	1.239	7.297	13.763
B	14.024	7.966	1.500	14.024	7.966	1.500
C	8.000	3.593	1.500	8.000	3.593	1.500
D	5.563	10.036	11.215	5.118	8.673	7.390

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FIG. 56C

TABLE 7D
VARIABLE INTERVAL
IN MACRO MODE
(PHOTOGRAPHIC DISTANCE
IS FROM IMAGE SURFACE)

	0.3m	0.077m
	f=12.55	f=10.72
A	4.406	4.406
B	10.857	10.857
C	3.864	3.864
D	10.270	4.960

TABLE 7E
PARAMETER VALUE OF
CONDITIONAL EXPRESSION

$(L_{1C}-L_{1W})/(L_{1T}-L_{1W})=0.253$
$(L_{3C}-L_{3T})/(L_{3W}-L_{3T})=0.364$
$(D_{3W}-D_{3T})/(D_{1T}-D_{1W})=0.52$
$(f_{12T}/f_1)=-1.223$

FIG. 57A

TABLE 8A

f=7.52～35.41, F=2.76～3.93, ω=33.03～7.33

SURFACE NUMBER	R	D	Nd	νd	REMARKS
01	49.347	1.20	1.84666	23.78	1st LENS
02	21.523	4.03	1.53172	48.84	2nd LENS
03	−735.434	0.10			
04	24.328	2.83	1.77250	49.62	3rd LENS
05	253.175	▲A			
06*	−60.958	1.00	1.84666	40.73	4th LENS
07	8.431	2.83			
08	−14.822	0.80	1.51680	64.20	5th LENS
09	12.501	1.89	1.84666	23.78	6th LENS
10	∞	▲B			
11	DIAPHRAGM	0.50			
12*	12.181	1.16	1.58913	61.25	7th LENS
13	19.058	▲C			
14*	10.066	2.66	1.51680	64.20	8th LENS
15	−37.782	0.23			
16*	26.397	2.21	1.48749	70.44	9th LENS
17	−19.437	0.10			
18	15.810	1.87	1.62374	47.05	10th LENS
19	−94.257	0.81	1.80518	25.46	11th LENS
20	6.298	▲D			
21	16.724	3.19	1.62004	36.30	12th LENS
22*	−226.088	OPTION			
23	∞	3.214	1.51680	64.20	VARIETY OF FILTERS
24	∞				

▲A: VARIABLE(A)
▲B: VARIABLE(B)
▲C: VARIABLE(C)
▲D: VARIABLE(D)

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FIG. 57B

TABLE 8B

NON-SPHERICAL SURFACE IN 6th SURFACE K=0.0, $A_4=7.30131\times10^{-5}$ $A_6=-7.18253\times10^{-7}$ $A_8=7.92813\times10^{-9}$ $A_{10}=-4.79927\times10^{-11}$
NON-SPHERICAL SURFACE IN 12th SURFACE K=-2.47920, $A_4=1.19559\times10^{-4}$ $A_6=-7.86193\times10^{-6}$ $A_8=8.04663\times10^{-7}$ $A_{10}=-3.15795\times10^{-8}$
NON-SPHERICAL SURFACE IN 14th SURFACE K=-1.36970 $A_4=-2.75811\times10^{-5}$ $A_6=-9.84986\times10^{-7}$ $A_8=-5.50234\times10^{-8}$ $A_{10}=-1.76532\times10^{-10}$
NON-SPHERICAL SURFACE IN 16th SURFACE K=-16.43413, $A_4=-5.94270\times10^{-5}$ $A_6=3.37933\times10^{-7}$ $A_8=8.00684\times10^{-8}$ $A_{10}=3.43034\times10^{-10}$
NON-SPHERICAL SURFACE IN 22th SURFACE K=0.0, $A_4=-4.02551\times10^{-5}$ $A_6=-2.96070\times10^{-6}$ $A_8=9.12260\times10^{-8}$ $A_{10}=-1.34602\times10^{-9}$

TABLE 8C
VARIABLE INTERVAL:
TYPICAL PHOTOGRAPHING REGION

	AT INFIN-ITY	AT INFIN-ITY	AT INFIN-ITY	0.3m	0.4m	0.5m
	SHORT FOCAL POINT END f=7.52	MIDDLE FOCAL LENGTH f=16.33	LONG FOCAL POINT END f=35.41	SHORT FOCAL LENGTH f=7.43	MIDDLE FOCAL POINT END f=15.76	MIDDLE FOCAL POINT END f=32.02
A	1.362	7.523	13.223	1.362	7.523	13.223
B	13.361	7.201	1.500	13.361	7.201	1.500
C	8.000	3.864	1.500	8.000	3.864	1.500
D	5.373	9.240	11.288	4.937	7.944	7.412

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FIG. 57C

TABLE 8D
VARIABLE INTERVAL IN MACRO MODE
(PHOTOGRAPHIC DISTANCE IS
FROM IMAGE SURFACE)

	0.3m	0.077m
	f=12.79	f=11.19
A	5.415	5.415
B	9.308	9.308
C	4.309	4.309
D	8.630	3.620

TABLE 8E
PARAMETER VALUE OF
CONDITIONAL EXPRESSION

$(L_{1C}-L_{1W})/(L_{1T}-L_{1W})=0.342$
$(L_{3C}-L_{3T})/(L_{3W}-L_{3T})=0.432$
$(D_{3W}-D_{3T})/(D_{1T}-D_{1W})=0.55$
$(f_{i2T}/f_I)=-1.211$